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Wisconsin State Plumbing Code-1922

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FROM

Gen. Leonard Wood

WISCONSIN STATE PLUMBING CODE



Revised by the
WISCONSIN BOARD OF PLUMBING
JANUARY 1, 1960
WISCONSIN DEPARTMENT OF REVENUE
MADISON, WISCONSIN
1960

RULES AND REGULATIONS

OF THE

WISCONSIN STATE BOARD OF HEALTH

GOVERNING THE

**CONSTRUCTION, INSTALLATION AND INSPECTION OF
PLUMBING AND DRAINAGE**

AND THE

LICENSING OF PLUMBERS



Fourth Edition, 1922

Eng 1109.22.5

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State Board of Health

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STATE PLUMBING LAW

Chapter 731, Laws of 1913

(As Amended by Chapter 383, Laws of 1919)

Laws relating to the licensing of plumbers, the supervision and inspection of plumbing, and the adoption and enforcement of a plumbing code.

Journeyman Plumber. SECTION 959—53. 1. (a) A journeyman plumber is hereby defined to be any person other than a master plumber, who, as his principal occupation, is engaged in the practical installation of plumbing.

Master Plumber. (b) A master plumber is hereby defined to be any person skilled in the planning, superintending and the practical installation of plumbing and familiar with the laws, rules and regulations governing the same.

Plumber's Apprentice. (c) A plumber's apprentice is hereby defined to be any person other than a journeyman or master plumber who, as his principal occupation, is engaged in learning and assisting in the installation of plumbing and drainage.

Where Licensed. 2. In any city or village of this state, having either systems of waterworks or sewerage, no person, firm or corporation, shall engage in or work at the business of a master plumber or journeyman plumber, unless licensed so to do by the state board of health in the manner herein provided.

Authorization for Granting Permits and Licenses. 3. The state board of health is hereby authorized and empowered to grant and issue licenses and permits to master plumbers and journeyman plumbers as hereinafter provided for.

Licensing by State Board of Health. SECTION 959—54. 1. Any person desiring to engage in or work at the business of a journeyman plumber or master plumber, not heretofore licensed, in any city or village of this state having either systems of waterworks or sewerage, shall apply to the state board of health for a license and be by said board examined as to his fitness for such work either as a journeyman plumber or as a master plumber as the case may be.

Licenses by Whom Required. 2. Any person, firm or corporation desiring to engage in or work at the business of installing plumbing, or who shall install plumbing in connection with the dealing in and selling of plumbing material and supplies in any city or village of this state having either systems of waterworks or sewerage, shall be required at all times to have a licensed master plumber in charge, who shall be responsible for the proper installation of all such plumbing. Any person, firm or corporation selling or dealing in plumbing materials or supplies but not engaged in the installation of plumbing, shall not be required to employ or have a licensed master plumber as provided for by this section.

Plumbing Examiners. SECTION 959—55. 1. The state board of health shall, within sixty days after the passage and publication of this act, appoint, and shall have power to remove, three plumbing examiners, of whom one shall be a practical master plumber, one shall be a practical journeyman plumber, and one shall be a member or employe of the state board of health, to be known as the committee of examiners for the examining of journeyman and master plumbers as to their qualifications and fitness to be entitled to licenses to engage in the work of master plumbers and journeyman plumbers herein provided for. Such examiners shall be exempt from the provisions of Sections 990—1 to 990—32 (Chapter 16) of the statutes. The state board of health shall have power and authority and it shall be its duty to prescribe, amend and enforce rules and regulations for the examination and licensing of journeyman and master plumbers consistent with this act.

Compensation and Expenses of Examiners. 2. Each member of said committee of examiners, except a regular employe or the secretary of the state board of health, shall receive a compensation of ten dollars per day and expenses for each day in which such member is actually engaged in attendance upon the meetings of the committee, to be audited and paid out of the general fund of the state treasury and charged against the appropriation account of the state board of health to carry into effect the provisions of sections 959—53 to 959—58, inclusive, of the statutes.

Examinations. 3. The licenses of journeyman and master plumbers provided for in section 959—53 of the statutes shall be issued by the state board of health upon evidences, as shown by the examination, of the fitness of the applicant for the business or practice of a master plumber or a journeyman plumber as the case may be.

Revocation of Licenses. 4. The state board of health shall have power to revoke any journeyman or master plumber's license if same was obtained through error or fraud, or if the recipient thereof is shown to be incompetent, and for a second wilful violation of any rules and regulations prescribed by the state board of health; provided, that before any license shall be revoked, the holder thereof shall have notice, in writing, enumerating the charges, and at a specified date named therein, not less than five days after the service of such notice, be given a hearing by said board and have an opportunity to produce testimony in his behalf. The state board of health shall have power to appoint, by an order in writing, its secretary or any competent person to take testimony, who shall have power to administer oaths, issue subpoenas and compel the attendance of witnesses, and the decision of the state board of health shall be based on its examination of all testimony and records. Any person whose license has been revoked may, after the expiration of one year from the date of such revocation, apply for a new license.

Licenses Without Examination. SECTION 959—55a. 1. All persons engaged on or before January 1, 1920, in the plumb-

ing business in this state in cities and villages having either systems of waterworks or sewerage, either as master plumbers or journeyman plumbers, and not heretofore licensed, shall be respectively licensed as such by the state board of health without examination, upon the payment to the state board of health of the license fee hereinafter provided. No person who desires to engage in the business or practice of plumbing, either as a master plumber or a journeyman plumber, after January 1, 1920, shall be granted a license until he has passed a satisfactory examination. Before any applicant for a journeyman plumber's license shall be permitted to take such examination, he shall pay to the state board of health the examination fee as herein provided for, and any applicant for a master plumber's license shall pay to the state board of health at the time of filing such application the sum of twenty-five dollars.

Rules and Regulations. 2. The state board of health shall prescribe and shall have power to amend the rules and regulations governing plumbing, drainage, sewerage and plumbing ventilation in connection with all buildings in this state and may prescribe minimum standards which shall be uniform throughout the state. This act shall not be construed to deny the right to any local governing body having jurisdiction to adopt and enforce additional rules and regulations relating to plumbing, drainage, sewerage and plumbing ventilation not inconsistent with the provisions of this act or the rules and regulations prescribed by the state board of health.

Inspectors and Employees. 3. The state board of health is empowered to employ, promote and remove plumbing inspectors and other assistants as needed, to fix their compensation and assign their duties. Such salaries, compensations and expenses shall be paid out of the general fund of the state treasury and charged against the appropriation account of the state board of health for carrying out the provisions of sections 959—53 to 959—58, inclusive, of the statutes.

Master License Requirements and Fees. SECTION 959—55b.
1. All master plumbers not heretofore licensed, engaged in

business as such in cities and villages of this state having either systems of waterworks or sewerage, desiring to continue as such, are hereby required to procure a master plumber's license from the state board of health within sixty days after January 1, 1920, the fee for which license is hereby fixed at twenty-five dollars, such license, unless sooner revoked, to expire on December 31, next after the issuance thereof, but no examination shall be required of such master plumbers making such application for license within the time hereby limited. Commencing January 1, 1920, and annually thereafter during the month of January of each year, a renewal fee of fifteen dollars shall be paid to the state board of health for a renewal of such license by all master plumbers, theretofore licensed, continuing in business as such in cities or villages having either systems of waterworks or sewerage within this state, provided that any person who neglects or fails to have his license renewed as above provided may have the same renewed by making application therefor within thirty days after January 31, and upon payment of five dollars revival fee and fifteen dollars renewal fee.

Journeyman License Required; Initial and Renewal Fees.

2. All journeyman plumbers not heretofore licensed, engaged in business as such in cities and villages having either systems of waterworks or sewerage, desiring to continue in business as such are hereby required to procure a journeyman plumber's license from the state board of health within sixty days after January 1, 1920, the fee for which license is hereby fixed at two dollars, such license, unless sooner revoked, to expire on December 31, next after the issuance thereof, but no examination shall be required of such journeyman plumbers making such application for license within the time hereby limited. Commencing January 1, 1920, and annually thereafter during the month of January of each year, a renewal fee of one dollar shall be paid to the state board of health for a renewal of such license by all journeyman plumbers, theretofore licensed, continuing in business as such in cities or villages having either systems of water-

works or sewerage within this state. Provided, that any person who neglects or fails to have his license renewed as above, may have the same renewed by making application therefor within thirty days after January 31, and upon the payment of one dollar revival fee and one dollar renewal fee.

License Expiration. 4. All licenses issued during any year, unless sooner revoked, shall expire on December 31 of such year.

Master Privileges for Journeymen. 5. A master plumber's license shall entitle the owner thereof to all the rights and privileges of a journeyman plumber.

Initial License Fees. 6. The fees for any person hereafter desiring to engage in the business of a journeyman plumber or a master plumber in cities or villages in this state having either systems of waterworks or sewerage and not licensed within sixty days after January 1, 1920, shall be respectively two dollars and twenty-five dollars.

Temporary Permits. 7. The state board of health may issue temporary permits to engage in the work of a master plumber or a journeyman plumber on payment of the fees prescribed in this act; such permits may be revoked by the state board of health at any time, and if on examination a license is granted, the fee paid for the permit shall run for the same period as though paid for a license. For the purpose of assisting in its work of issuing such temporary permits, the state board of health may appoint agents without compensation.

Apprentices; Qualifications for License. 8. Any person working as an apprentice at the business or practice of plumbing, for such time as the state board of health may prescribe in its rules and regulations for the licensing of plumbers and desiring to take an examination for a license as a journeyman plumber, may file his application for such examination with the state board of health as herein provided, and upon giving due notice of the filing of such application with said board, may be granted a permit by the state board

of health to pursue said work in the capacity of journeyman plumber until such time as said examining board shall have an opportunity to examine him. When deemed necessary, the state board of health may authorize and empower one member of said examining board, or one of the plumbing inspectors employed by the state board of health, to hold and conduct a special examination to determine the qualifications of an applicant for a temporary permit, the results of such examination to be reported in writing by the examiner to the state board of health.

License Reciprocity. 9. The state board of health may license without examination, upon the payment of the required fee, applicants licensed under the laws of other states having requirements for licensing and regulating plumbing which are determined by the state board of health to be equivalent to the requirements of this state.

Penalty for License Violation. SECTION 959—56. 1. Any person who shall engage in the work of a master or a journeyman plumber for compensation without a permit or a license as provided in sections 959—53 to 959—56, inclusive, of the statutes, shall be deemed guilty of a misdemeanor and shall be subject to a fine of not less than ten dollars nor exceeding fifty dollars, or imprisonment in the county jail not exceeding thirty days for each and every violation thereof. Each day of such violation shall constitute a separate offense.

Penalty for Plumbing Code Violation. 2. Any person who shall violate any of the provisions of sections 959—53 to 959—56 of the statutes, inclusive, or shall do any act prohibited in sections 959—53 to 959—56, inclusive, or shall fail or refuse to perform any duty lawfully enjoined within the time prescribed by the state board of health, or shall fail, neglect or refuse to obey any lawful order given or made by the state board of health, or any judgment or decree made by any court in connection with the provisions of sections 959—53 to 959—56, inclusive, for such violation or refusal shall be guilty of a misdemeanor and shall be punished by imprisonment in

the county jail not more than three months or by fine not exceeding one hundred dollars.

Penalty for Employing Apprentice as Journeyman Plumber.

3. Any master plumber who shall employ an apprentice on any plumbing work, representing him to be a journeyman plumber, or who shall charge for the services of such apprentice a journeyman plumber's wage, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not more than twenty-five dollars or by imprisonment in the county jail not more than thirty days. Each day of such violation shall constitute a separate offense.

Fees. Section 20.43 (9). All moneys received by the state board of health and vital statistics from the licensing of plumbers shall be paid within one week after receipt into the general fund, and are appropriated therefrom for the examination and licensing of plumbers, as provided in sections 959—53 to 959—58, inclusive.

Local Plumbing Inspectors. SECTION 959—57. The council of each city of the first, second and third class, however organized, having a system of waterworks or sewerage, or the officer or board of any such city to whom such authority is delegated, shall appoint and may for cause remove one or more inspectors of plumbing who shall be practical plumbers, and the council of any city of the fourth class, however organized, and the village board of any village may appoint and may for cause remove one or more inspectors of plumbing who shall be practical plumbers or other skilled sanitarians or persons familiar with plumbing and competent to perform the duties of such office. The compensation of such inspector or inspectors shall be determined by the council or village board, as the case may be, and shall be paid from the city or village treasury; they shall inspect all plumbing work in the city or village for which appointed, whether such work be new or consist of alterations or repairs; and shall report to the council, village board or other appointing body, as the case may be, all violations of any law, ordinance, or by-law relating to such work; and shall perform such other appropriate duties as may be required.

Local Ordinances; Permits; Materials; Appurtenances; and Other Regulations. SECTION 959—58. 1. Each city of the first, second and third class having a system of waterworks or sewerage shall, and any city of the fourth class and any village may, by ordinance or by-law, prescribe rules and regulations for the materials, construction, alteration and inspection of all pipes, faucets, tanks, valves and other fixtures by and through which supply or waste water or sewage is used or carried, and provide that they shall not be placed in any building therein except in accordance with plans which shall be approved by the board of public works, where such board exists, or the board of health of such city or village, or such person or persons as either of said boards may designate; and shall further provide that no plumbing shall be done, except in case of repairing leaks, without a permit first being issued therefor upon such terms and conditions as such city or village shall prescribe; provided that no such ordinance, by-law, rule or regulation prescribed by any such city or village shall be inconsistent with this act or any rule or regulation adopted or prescribed by the state board of health; and provided further, that no city or village shall be authorized to or require the licensing of journeyman or master plumbers or prevent any such plumbers who are licensed under the provisions of this act from engaging in or working at the business for which they are respectively licensed in any place in this state.

Limitation of License Requirement. 2. The provisions of sections 959—53 to 959—58, inclusive, shall apply only to cities and villages having a population of three thousand or more according to the last federal census.

EXPLANATION OF THE LAW, RULES GOVERNING EXAMINATIONS, AND INSPECTION OF PLUMBING

Licenses Where Required. In any city or village of this state having a population of 3,000 or more, no person, firm or corporation shall engage in or work at the business of master or journeyman plumber unless licensed so to do by the state board of health.

Licenses Where Not Required, or Optional. Licenses under the provisions of the law are not required in places having a population of less than 3,000, but may, however, in accordance with an opinion of the Attorney General, be issued under the waiver provision upon application, providing such application was made during the months of January and February, 1920, or by examination if made subsequent to February 29, 1920.

Licenses by Examination. After February 29, 1920, licenses or permits may be issued only upon evidences as shown by examination of the fitness of an applicant for the business or practice of a master or journeyman plumber, as the case may be. A nonresident plumber desiring to engage in the work of plumbing and drainage in any city or village having a population of 3,000 or more in this state must secure a state license as master to superintend the work, or place in charge a person licensed as such; when journeymen are employed they also must be duly licensed.

Plumbing apprentices are not eligible to examination or license unless they have had the experience provided in Rule 1 governing examinations.

In accordance with an opinion from the Attorney General, in cases of firms or corporations, all members thereof per-

forming the work of a master plumber (designing and superintending plumbing installations) must secure master licenses in all cities where licenses are required.

Application blank must be properly filled out by the person applying for license, vouched for, sworn to, accompanied by the fee of \$25 for master and \$2 for journeyman, and returned to the office of the State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering, Madison, Wisconsin.

Remittance for license fees should be made by post-office or express money order, bank draft or certified check, made payable to the state board of health. Do not send currency except by registered mail.

Where Plumbing Code Applies. The rules and regulations adopted by the state board of health governing plumbing, drainage and sewerage and plumbing ventilation, known as the State Plumbing Code, apply to all buildings in this state in any township, incorporated village or city. (See section 959—55a (2), Laws of 1913.)

Local Rules and Regulations. Cities of the first, second and third class shall, and cities of the fourth class may by ordinance or by-laws prescribe rules and regulations for material, construction, alteration and inspection of all fixtures by and through which supply or waste water or sewerage is used or carried and shall further provide that no plumbing shall be done, except in case of repairing leaks, without a permit being first issued therefor upon such terms and conditions as such city shall prescribe, provided such rules and regulations are not inconsistent with the State Plumbing Law or Code. (See section 959—58, Wisconsin Statutes.)

Local Plumbing Inspectors. Cities of the first, second and third class are required by law to appoint one or more local inspectors of plumbing and the smaller municipalities may do so. Inspectors so appointed shall inspect all plumbing in accordance with the provisions of section 959—57 of the act, and as provided for under the provisions of the local ordinance governing the same.

State inspection. The state plumbing inspectors will make such inspections of plumbing, private water and sewage disposal systems as may seem necessary. All requests for state inspection should be made direct to the state board of health, bureau of plumbing and domestic sanitary engineering.

Adjudication of Differences. In case of any radical dispute or difference arising between the local inspector and the plumber in charge, the facts should be submitted to the state health officer for consideration. If the state board of health or the state health officer deems a hearing necessary, such hearing will be granted as provided for in section 1407a—6 of the Statutes. The decision of the state board of health shall be final.

Discretionary Powers. When for specific reason it may be impractical to make an installation so as to comply strictly with the provisions of this code, or where new installations or additions are made reasonably in conformance with this code as it pertains to plumbing and drainage design, materials, construction and appliances, the plumbing inspectors employed by the state board of health shall have discretionary power to permit such modifications as are not inconsistent with the spirit and substance thereof. All such modifications must be reported in writing in a manner prescribed by the state board of health, and filed as official record.

RULES GOVERNING THE EXAMINATION OF PLUMBERS

The rules and regulations governing the examination and licensing of plumbers adopted by the state board of health on April 6, 1914, and published in the official state paper on April 10, 1914, were amended by the state board of health on January 20, 1920, and published in the official state paper on January 23, 1920, to read as follows:

RULES GOVERNING EXAMINATIONS

1. **Qualifications for Journeyman Plumber.** The state board of health rules that three years' experience as a helper or apprentice shall constitute a reasonable time in the busi-

ness; or the candidate for license must be a graduate of a recognized trade school in Wisconsin which gives at least a two years' course.

Applicants for journeyman's license who attend a recognized trade school in Wisconsin and who are not graduates of such school will be given full credit for the work done in the trade school as a part of the required three years' experience as a helper or apprentice. Graduates of the University of Wisconsin extension course in plumbing will be given six months' credit as a part of the required three years' experience as a helper or apprentice. Work done in night or continuation schools will be given suitable credit.

2. Qualifications for Master Plumber. All applicants for a master plumber's license must have reached the age of 21, and have had three years' experience as a journeyman plumber; except where applicant is a graduate of recognized trade school in Wisconsin, giving at least a two years' course, when two years' experience as a journeyman will be sufficient. Graduates of the University of Wisconsin extension course in plumbing will be given six months' credit as a part of the required three years' experience as a journeyman. Work done in night or continuation schools will be given suitable credit.

3. Application. Application blanks for examination and temporary permits may be obtained from the state board of health.

The license fee, which must be sent to the state board of health with the application, is two dollars for a journeyman plumber, and twenty-five dollars for a master plumber.

Candidates should exercise great care to see that applications are properly and completely filled out.

4. Temporary Permits. Temporary permits to do the work of a journeyman plumber or a master plumber may be issued by the state board of health to a candidate for examination who submits properly filled out application, accompanied by the same fee required for license. This fee entitles the holder of a temporary permit to take the next examination, and it not returnable in case of failure to pass examination.

The temporary permit becomes void upon the date following next examination when notice of the result of such examination is given. Such permit, however, must be surrendered to the state board of health upon the date of the next examination. Temporary permits to engage in business as a master plumber will not be issued except in especially urgent cases.

When deemed necessary, the state board of health may require a special examination to determine the qualifications of an applicant, before a temporary permit will be issued.

Note: Before engaging in the plumbing business, applicants for master's license should be thoroughly convinced of their qualifications and ability to pass the state examinations. Experience has proven that the inability of candidates, holding master plumber's temporary permits, to qualify for master's licenses has led to expensive difficulties with property-owners when their failure to pass in examination and to obtain licenses required suspension of work as master plumbers. Until after obtaining a master plumber's license, therefore, a candidate for such license should not assume obligations which he can carry out only by placing a licensed master plumber in charge. By observing this precaution he will conserve the best interests of all concerned and avoid criticism arising from the causes mentioned.

5. Time of Examinations. Regular examinations for the licensing of journeyman and master plumbers will be held during the months of February and August of each year, and special examinations at such time as the state board of health may direct. The place of all regular examinations and of special examinations shall be determined by the state board of health.

All applications for examination must be on file in the office of the state board of health prior to the date of examination.

6. Notice of Examination. Notice of the time and place of examination will be sent to all those who have applications on file in the office of the state board of health at least one week prior to the date of such examination. Such notice will be mailed to the address given on the application blank. Notice of the time and place of each examination will be given in the official state paper at least ten days prior to such examination.

7. Character of Examinations. The examination for licensing journeyman and master plumbers shall be conducted by the committee of examiners, and shall consist of both oral

and written and practical tests. The examination will cover the theory and practice of plumbing, the interpretation of charts and blueprints and plans of plumbing installation, and such other tests as the committee may deem necessary in order to properly pass upon the qualifications of the candidate.

The character, experience and fitness of the applicant will also be taken into consideration.

8. Reëxamination. An applicant who fails in an examination shall be eligible for the next examination without the payment of an additional fee. Should he fail in the second examination he shall not be eligible for the third examination until the expiration of six months. Failing in the third examination he shall not be eligible for the fourth examination until the expiration of one year, and a fee equal to the initial license fee must accompany applications for third, fifth or subsequent examinations. All applications will expire and be cancelled after a period of one year if the applicant fails to appear for examination within such period.

9. Renewals. Notice for renewal of license will be sent to all licensed plumbers according to the address on the application blanks on file in the office of the state board of health, unless notice of another address is given.

All applications for renewal of licenses must be on file in the office of the state board of health not later than January 31 of each year, accompanied by the proper renewal fee of \$15.00 for master plumbers and \$1.00 for journeyman plumbers. Any person who neglects or fails to renew his license on or before January 31 of each year may have said license renewed upon payment of the renewal fee and of a revival fee of \$5.00 for a master's license and the renewal fee and a revival fee of \$1.00 for a journeyman's license, provided that such application for revival is made within thirty days after January 31 of each year.

Renewal license cards will be issued as rapidly as possible upon receipt of application and fee.

10. Exchange of Licenses. The following rule providing for the exchange of master plumbers' licenses for journeyman

plumbers' licenses was adopted by the state board of health on January 31, 1917:

"All master plumbers in good standing and licensed by the state board of health, who desire to engage in the plumbing business solely as a journeyman plumber, shall, upon application and upon payment of the initial license fee of two dollars, be issued a journeyman plumber's license; journeyman plumbers who also hold master plumbers' licenses shall, upon application, be re-licensed as master plumbers upon the payment of the fee as provided by law for the renewal of such licenses."

The exchange of a license from master to journeyman therefore is permissible. In no such case is a second initial fee required of either a master or journeyman plumber.

11. Materials Used in Examination. All applicants are expected to furnish the necessary tools, furnace, solder pot and solder for the practical examinations. The state board of health will furnish gasoline and other material necessary to conduct such examination.

Penalty. SECTION 959—56—1. Any person who shall engage in the work of a master or a journeyman plumber in any city of this state, except cities of the fourth class having a population of three thousand or less, for compensation without a permit or a license as provided in Chapter 731, Laws of 1913, as amended by Chapter 383, Laws of 1919, sections 959—53 to 959—56, inclusive, shall be deemed guilty of a misdemeanor and shall be subject to a fine of not less than ten dollars nor exceeding fifty dollars, or imprisonment in the county jail not exceeding thirty days for each and every violation thereof. Each day of such violation shall constitute a separate offense.

THE ATTORNEY GENERAL HAS RULED:

That not only is a firm required at all times to have a licensed master plumber in charge of the installation of plumbing, but each member of a firm who engages in the work of superintending plumbing installations in cities of more than

3,000 population is required to secure a license as master. Where journeymen are employed, they must be licensed. (*Extract from opinion dated November 19, 1913.*)

That a person is not engaged in the plumbing business unless, in addition to dealing in and selling of plumbing materials and supplies he also engages in the business of installing such plumbing materials. (*Extract from opinion dated November 6, 1913.*)

That a nonresident plumber engaged in work in this state must secure a state license as master to superintend the work, or place in charge a person licensed as such, and must have duly licensed journeymen working under him in all cities having a population of 3,000 or more. (*Extract from opinion dated November 6, 1913.*)

That failure to renew a license each year revokes such license; and that any master or journeyman who fails to renew his license each year must pass an examination and pay the initial fee before a new license can be granted him. (*Extract from opinion dated November 19, 1913.*) See also opinions under date of July 21, 1916.

That a city ordinance or by-law in cities of more than 3,000 population providing that no local permit for the installation of plumbing shall be granted to anyone who has not a state license, is not inconsistent with the provisions of the act. (*Extract from opinion dated February 2, 1914.*)

That it is necessary for a master plumber or a journeyman plumber engaged in the plumbing business at the time of the passage and publication of the law to make application for license within sixty days after the passage and publication of the law, if he desires a license without examination. (*Extract from opinion dated March 3, 1914.*)

That the passage of the state plumbing law and the adoption by the state board of health of the state plumbing code did not repeal local ordinances governing the installation of plumbing except in so far as local ordinances are inconsistent with the statutes and the state plumbing code. (*Extract from opinion dated April 29, 1914.*)

That cities desiring to adopt and enforce regulations additional to those prescribed by statute and the state plumbing

code, unless such additional regulations are contained in ordinances or by-laws heretofore enacted, must make them by a new ordinance or by-law in order that they may have any force or effect. (*Extract from opinion dated April 29, 1914.*)

That the state board of health may make rules and regulations covering the question of the amount of material to be installed, and for a second wilful violation of such rule the license of a master plumber may be revoked. (*Extract from opinion dated April 29, 1914.*)

That a plumber in a city or village in which no license is required shall, upon application, be granted a license either under the waiver act, if application is made within sixty days after the passage and publication of the law, or by examination if made subsequent to that date. (*Extract from opinion dated March 3, 1914.*)

That any resident of a city where the appointment of a local plumbing inspector is required may bring a mandamus action against the city to compel the appointment of an inspector of plumbing. (*Extract from opinion dated September 2, 1914.*)

That any person, firm or corporation in cities of more than 3,000 population is prohibited from repairing plumbing, installing new plumbing or engaging in the plumbing business as a master plumber or journeyman plumber without a state license. (*Extract from opinion dated August 24, 1915.*)

That the state board of health may, under its rules and regulations, make it possible to grant a license to employes of manufacturing concerns or other persons to do plumbing work even though such person is not continually engaged in the work of a journeyman plumber or a master plumber. (*Extract from opinion dated August 24, 1915.*)

That when a property owner provides the plumbing material for his premises a journeyman plumber is prohibited from installing such material unless the work is done under the supervision of a master plumber. (*Extract from opinion dated November 15, 1915.*)

That an apprentice cannot be placed in charge of the work of installing plumbing and do such work alone; neither can such apprentice install plumbing under the supervision of a

master plumber when such master plumber is not also physically present and taking an active part in the installation of said plumbing. (*Extract from opinion dated November 15, 1915.*)

That a master plumber who fails to renew his license is entitled to a renewal at some future time without re-examination, provided the applicant does not work as a master plumber in this state (where a license is required), during the temporary suspension of his license. (*Extract from opinion dated July 21, 1916.*)

That the state board of health may prescribe by properly published rules and regulations the proper plumbing and sewerage equipment for public schools and other public buildings. (*Extract from opinion dated August 11, 1916.*)

That the state board of health is authorized to adopt and enforce a rule authorizing a master plumber duly licensed, who is now, and perhaps for some time will be doing the work of a journeyman plumber, to take out a license as a journeyman plumber without examination, and that a journeyman plumber who has obtained such license as the result of being heretofore licensed as a master plumber can obtain a master plumber's license without examination upon the payment of the usual master plumber's renewal fee. (*Extract from opinion dated January 11, 1917.*)

That the statutes seem to contemplate the licensing of persons who are to engage in the occupation or business of plumbing, and that nowhere do the statutes appear to be intended to apply to a person who is at work for himself in his own building or on his own premises, provided such installations are made in compliance with the minimum requirements of the state plumbing code and local ordinances. (*Extract from opinion dated July 7, 1917.*) Also see extract from opinion dated February 2, 1914, that cities may require by ordinance that no permit shall be issued to anyone not holding a state license. Also see section 959—58 of the statutes.

That plumbers employed by the state as employees of the state, in connection with state buildings, do not come within

the purview of the licensing provisions of the statutes. (*Extract from opinion dated December 17, 1919.*)

STATE PLUMBING CODE

The Rules and Regulations herewith presented and known as the State Plumbing Code were adopted by the state board of health on April 6, 1914, and published in the official state paper as required by law on April 10, 1914, amended January 20, 1916, and amendments published in the official state paper as required by law on February 2, 1916. They were further amended on June 28, 1921, which amendments were published in the official state paper on July 15, 1921. Under the provisions of section 959—55a—2 (Chapter 731, Laws of 1913) these Rules and Regulations have the force of law.

The sketches accompanying the various sections of this code, illustrating methods of plumbing design and construction, water supply and drainage installations, and the tables, rules and calculations necessary for the solution of plumbing problems (p. 116, et seq.) have been adopted by the state board of health as an integral part of this code.

Lack of knowledge of the provisions of this code will not be accepted as an excuse for noncompliance with its requirements.

A copy of the code and law may be obtained at any time upon application. A charge of 50 cents, equivalent to cost of publication, is made to nonresidents.

It is essential that adequate information be given when requesting assistance in designing or constructing plumbing, private water supply or sewage disposal systems. This can be done best by a rough pencil sketch adequately showing the situation. (See sections 56, 57 and 58, and information sketch No. 56, page 138.) The state plumbing inspectors will make such inspections of plumbing, water supply and sewage disposal as may seem necessary. Requests for state inspections and communications should be addressed to

STATE BOARD OF HEALTH,
Bureau of Plumbing and
Domestic Sanitary Engineering,
Madison, Wis.

RULES AND REGULATIONS OF THE WISCONSIN STATE BOARD OF HEALTH GOVERNING THE CONSTRUCTION, INSTALLATION AND INSPECTION OF PLUMBING AND DRAINAGE

DEFINITION OF TERMS

Plumbing Work embraces all piping and appurtenances in connection with the drainage, ventilation or water supply systems within, and to a point from three to five feet outside the building or other parts of the structure, and may include the water service and house drain piping and appliances to the mains in the street, alley or other terminal.

House Sewer or Main Drain is that part of the horizontal piping beginning three feet from the foundation wall to its connection with the main sewer or cesspool or bacterial tank, or other disposal terminal.

House Drain is that part of the horizontal piping of a house drainage system which receives the discharge of all soil, waste and other drainage pipes inside the walls of any building and conveys the same to the house sewer, three to five feet outside the foundation wall of such building.

A Storm Drain is a conduit for carrying off surface, storm and clear waters.

A Combined Sewer is a sewer or drain intended to receive domestic sewage, industrial water-carried wastes, surface, storm and clear waters.

A Sanitary Sewer is a drain or sewer constructed to convey organic sewage from buildings to a septic or bacterial treatment tank or other point of disposal and from which all surface and storm water is excluded.

Private Sewer is one which has an independent sewage disposal, not connected to a public sewer, and which accommodates one or more houses.

Subsoil Drain is that part of a drainage system which conveys the ground or seepage water from the foot of walls or below the cellar bottom to the house sewer, independent of the house drain.

Conductors or Roof Leaders are the pipes which carry the storm or rain water from the roofs of buildings to the house, storm or yard sewer, basin, or rainwater cistern. The vertical portion of the conductors is usually referred to as the downspout and may be located within or outside the building.

Back Flow is a term which denotes the reversal of flow in a drainage system.

Dead End is that part or branch of a drainage system which is without a free circulation of air.

A Septic or Biological Tank is a reservoir or tank which receives crude sewage, and by bacterial action and sedimentation effects a process of purification and clarification.

Cesspool is an excavation in the ground made for the reception of crude sewage, and so constructed that the organic matter is retained while the liquid portion is permitted to seep through its walls.

Rural or Isolated Buildings are understood in this code to be those situated at such a distance from a public sewer system that their drainage systems cannot become tributary thereto.

Soil Pipe is any pipe which conveys the discharge of water-closets with or without fixtures to the house drain.

Waste Pipe is any pipe which receives the discharge of any fixture except water-closets and conveys the same to the soil pipe or house drain.

Main Soil or Waste Vent is that part of the main soil or waste pipe above the highest installed branch or fixture connection, extending through the roof.

Vent Pipe is any pipe provided to ventilate a drainage and plumbing system of piping and to prevent syphonage and back pressure.

Back Vent Pipe is that part of a vent pipe line which connects directly with an individual trap underneath or back of the fixture and extends to the branch, main, soil or waste pipe at any point higher than the fixture or fixture traps it serves.

Unit Vent is one which denotes an installation so arranged that one pipe will serve two traps.

Circuit Vent is a connection made by joining a nearly horizontal trap outlet with a waste and vent pipe in such a manner that a continuous vent is formed.

A Local Vent is a pipe or shaft serving to convey foul air from plumbing fixtures or rooms to the outer air.

Trap is a fitting constructed to prevent the passage of air or gas through a pipe without materially affecting the flow of sewage or waste water.

Depth of Trap Seal is indicated by the height of the water column measured between the overflow and the dip separating the inlet and outlet arms of the trap.

Deep Seal Resealing Traps. A deep seal resealing trap of the centrifugal self-scouring type is a trap in which the water motion is both centrifugal and upward at each discharge of the fixture and retains an adequate amount of water to form an efficient trap seal.

Deep Seal is a term applied to a trap having a water seal twice the depth of the common trap.

Free Circulation of Air for the purpose of this Code is understood to mean a plumbing and drainage system so designed and installed as to keep the air within the system in free circulation and movement, and to prevent with a margin of safety unequal air pressures of such force as might blow, syphon or affect trap seals, or retard the discharge from plumbing fixtures.

Roughing In is the placing of all that part of drainage or vent system which can be completed before the plumbing fixtures are installed.

Wiping a Joint is a method of joining two pieces of metal, in which the solder is fused on the joint and wiped to a smooth neat finish with a wiping cloth, and having a thickness of solder over that part of the joint where the metals join of not less than one-fourth inch.

Brased Joint is a method of joining substantially two pieces of metal by telescoping the parts to be joined and fusing by means of soft solder or solder made of granulated yellow brass.

Sanitary Plumbing is understood in this Code to denote plumbing so designed and installed that it can be kept clean, is free from defects in construction and conforms in every particular to the provisions of this Code.

Alignment is understood in this Code to indicate "in a straight line," graded, horizontal or perpendicular.

Repairs and Stoppages. Repairs are defined to consist of fixing leaks and removing of obstructions in soil, waste and supply pipes and to restore defective valves, faucets and similar appliances to an efficient operating condition.

Terminal is that part of a drainage or vent system which projects above the roof of the building or the end of the house drain connecting to the septic tank or house sewer.

Private Dwelling is understood in this Code to be any building used only for living purposes and occupied by not more than two families.

Public Building as defined by the State Building Code means any structure used in whole or in part as a place of resort, assemblage, lodging, trade, traffic, occupancy, or use by the public, or by three or more tenants.

Basement may be defined as that portion of the building whose floor line is below the grade at the main entrance and whose ceiling is not more than nine feet above the grade. The first floor is that next above the basement, or the lowest floor if there is no basement. The total number of stories in a building is understood to embrace all stories except the basement.

Height of Building shall be measured at the center line of its principal front, from the street grade (or if setting back from the street, from the grade of the ground adjoining the building), to the highest part of the roof, or if a gabled or hipped roof to a point two-thirds of the height of the roof. If the grade of the lot or adjoining street in the rear or alongside of the building falls below the grade at the front, the height shall be measured at the center of the building.

Place of Employment means every place, whether indoors or out or underground and the premises appurtenant thereto, where either temporary or permanently any industry, trade

or business is carried on or where any process or operation, directly or indirectly related to any industry, trade or business, is carried on, and where any person is directly or indirectly employed by another for direct or indirect gain or profit, but shall not include any place where persons are employed in private domestic service or agricultural pursuits which do not involve the use of mechanical power.

Approved. The term "approved" means approval by the local plumbing or building inspector or state board of health or industrial commission in conformance with the respective laws and regulations governing.

CLASSIFICATION OF BUILDINGS

Kind of building	Department or other authority having jurisdiction
Places of employment—factories, office and mercantile buildings, and other places of employment.	Toilet room requirements for public buildings and places of employment, issued by Industrial Commission and State Board of Health.
Public buildings, school buildings, libraries, museums, places of detention.	“
Apartment and tenement houses.	“
Theatres and Assembly halls.	“
Hotels or rooming houses (5 or more rooms). Restaurants. Barber shops.	“
Public comfort stations.	State Board of Health, Industrial Commission, Dairy and Food Commission.
Slaughterhouses, rendering plants.	State Plumbing Code.
Creameries, cheese factories.	State Board of Health.
Private residences and two-family flats.	State Board of Health laws.
Buildings not tributary to public sewerage systems—waste disposal of.	University and Normal School Regents, State Board of Control.
General health regulations.	
University buildings and state institutions.	

Note: All engineering services performed by the State Board of Health and other state departments are required to be done under the direction of the State Department of Engineering. (Sec. 1636—250-4).

All plumbing systems or installations are subject to local and state inspection by proper authorities. Piping for plumbing installations for the above named buildings must be done as provided for in the State Plumbing Code, or in accordance with local regulations where such exist. See Reference for Public Toilet Rooms on next page.

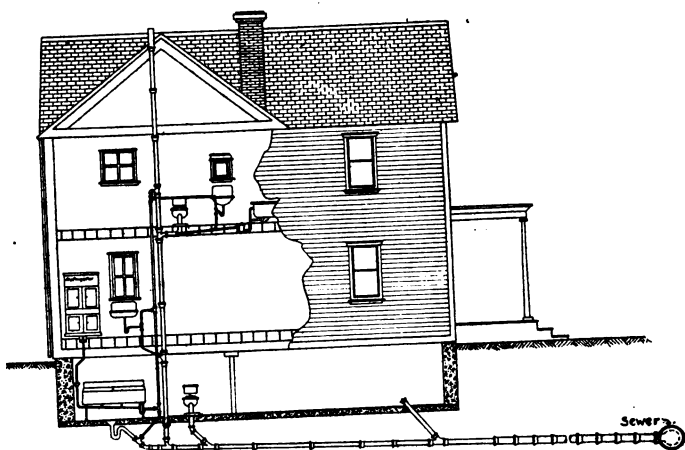
CONSTRUCTION OF PUBLIC TOILET ROOMS

For information regarding location, construction, sanitation and care of toilet rooms, and the number and kind of fixtures required for public buildings and places of employment, see General Orders of the Industrial Commission and the state board of health defining toilet room requirements for public buildings and places of employment, on pages 93 to 105 of this Code, and which are the same as those contained in the State Building Code issued by the industrial commission.

These provisions apply to the construction of all buildings except private residences and two-family flats.

For public comfort stations consult the Wisconsin Public Comfort Station Code and Rest Room Suggestions.

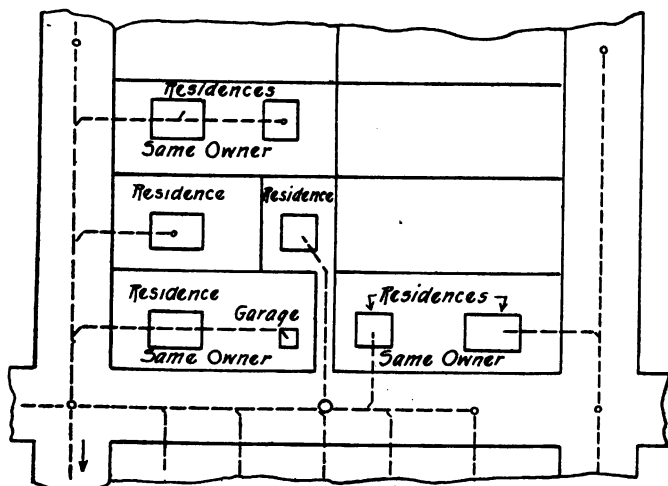
Copies of the Comfort Station Code and Plumbing Code may be procured from the Wisconsin State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering, Madison, Wis. A charge of 50 cents each, equivalent to the cost of publication, is made to nonresidents.



Sketch No. 1.—Illustrating typical residential installation.

SEWERS AND DRAINS

Section 1. (a) One Drain for Each Building. The plumbing system of each new building, or new plumbing installed in an existing building, shall be entirely separate from and independent of that of any other building, except as provided for in the following section.

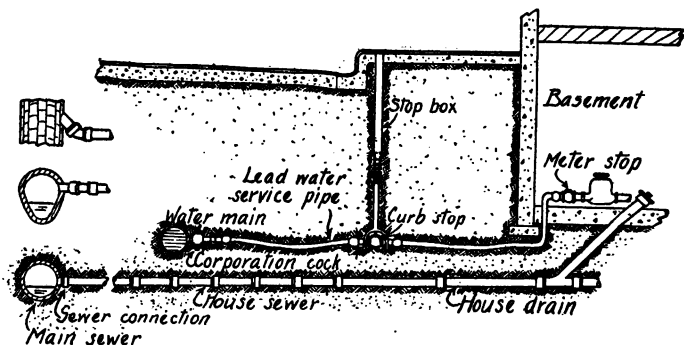


Sketch No. 2.—Illustrating provisions of Section 1 (b).

Wherever practicable every building shall have an independent connection with a public or private sewer.

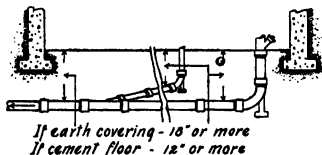
(b) Two or More Buildings on a Lot. Where a building stands in the rear of another on the same lot, the house drain from the front building may be extended to the rear building, private garage or barn, and the whole will be considered as one house drain. (See Sketch No. 2.)

Section 2. (a) Underground House Drains. All house drains wherever possible shall be brought into the building underground below the level of the basement or cellar floor. (See Sketch No. 3.)



Sketch No. 3.—Typical installation of house drain to point within building. Sec. 2 (a).

(b) Materials Used. All house drains shall be made of vitrified clay or cast iron pipe. The use of vitrified clay pipe is permitted where the ground or soil covering is 18 inches or more, provided that in cases where a substantial cement floor is laid 12 inches covering is permissible. Vitrified clay pipe must not be used in the construction of a house drain when the ground or soil has not the proper stability to insure an unyielding foundation. (See Sketch No. 4.)



Sketch No. 4.—Showing minimum covering required for vitrified clay pipe. Sec. 2 (b).

proper stability to insure an unyielding foundation. (See Sketch No. 4.)

Note: Cast iron pipe is always preferable to vitrified clay pipe as it is stronger and more durable. When laid in ground or material containing clinders, ashes or ingredients that will affect cast iron, it should be adequately protected.

Section 3. Trenches for Pipes. When found necessary by proper state or local authorities for purpose of inspection all excavations necessary for the installation of a house drainage system or any part thereof within the walls of a building shall be open trench work.

Section 4. (a) Subsoil Drains. Where subsoil drains are used, the same shall be made of open-jointed drain tile, properly trapped before entering the house drain.

Note: See Section 40 for sketch and method of installation.

(b) Sizes and Grades of Drains. The size of a house sewer or drain, if a sanitary sewer, shall be determined by the number of fixtures served; if a combined sewer by the roof area to be drained and other waters tributary to the same; but in no case shall the sewer or drain be less than six inches in diameter from main sewer in street to curblin.

All drains outside of buildings from main sewer to lot line and designed to receive solid substances must be at least six inches in diameter, must have a grade of one-fourth ($\frac{1}{4}$) inch per foot or more but in no case shall the grade be less than one-eighth ($\frac{1}{8}$) inch per foot; provided, that underground house drains for residences or other small buildings may be constructed of four-inch cast iron pipe from main in street or lot line, installed in the manner as prescribed for soil pipe, and provided further,

(1) that the surface area covered by the building and drains tributary so connected to a combination sewer does not exceed 1,500 square feet;

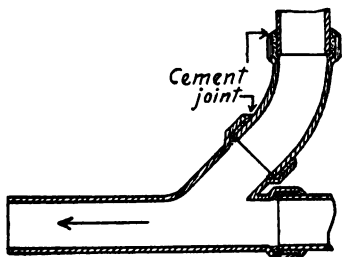
(2) that the amount of sewage tributary from plumbing fixtures and appliances where the building drain is connected to a sanitary sewer does not exceed the carrying capacity of the four-inch pipe so installed.

No house drain serving any fixture shall be less than 4 inches in size, and all underground drains within the building shall be considered as part and parcel of such house drain. Provided that branch drains serving basins, sinks, or similar small fixtures arising perpendicularly or at angle of 45° , not exceeding 5 feet in length, may be made of a size as required in Chart A (page 38). It is further provided that a 2-inch cast iron pipe laid at a fall of one-fourth inch per foot, not to exceed 5 feet in length, may be used to serve as a 2-inch basement floor drain. And that under floor work in connection with bath and toilet rooms may be installed as prescribed for installations above the ground floor.

(c) Additional Grade Permitted. In cases where main sewer in the street has sufficient depth or where a lot is

three feet or more above grade line, the drain between the curb line and lot line may receive such greater inclination as may be provided for by local ordinance or as in the judgment of the authorized inspector is permissible.

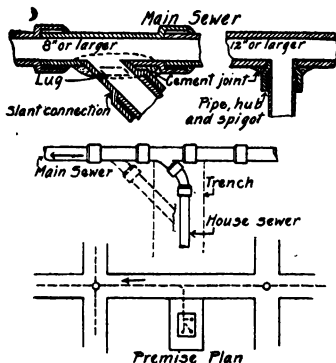
(d) **Drains, Ends and Connections Guarded.** The ends of all sewer and drain pipes not immediately connected shall be



Sketch No. 5.—Showing change of direction of horizontal clay pipe. Sec. 4 (e).

securely closed so as to prevent the introduction of sand or earth; and where the end of the sewer or drain pipe is connected with a temporary catch basin for draining foundations during the erection of any buildings or for other purposes the drain layer shall guard the same against the entrance of sand or earth.

(e) **Change In Direction and Alignment.** All sewer and drain pipes shall be laid carefully in a trench with perfect alignment where the bottom is trimmed to a perfect grade; and any deviation or change of direction from a straight run should be made by the use of proper curves and Y's. No sewer or drain pipes shall be clipped where proper fittings can be used for change of direction. (See Sketch No. 5.) Joints shall be made in accordance with Section 23.



(f) **Connection to Main Sewers.** When in accordance with measurements furnished by the local governing body or its authorized representatives the sewer connection is not

Sketch No. 6.—Illustrating method of connecting house sewer to main sewer. Sec. 4 (f).

found within three feet of the direction of the flow, a slant connection and one-eighth bend shall be used, or if a small drain a proper connection inserted, and such connection or insertion shall be made under the direction of the authorized representative of the municipality. (See Sketch No. 6.)

Note: The provisions of this section are intended to serve where no local ordinance is in force.

(g) Back Filling. Back filling must be made with due care, in a workmanlike manner and according to approved standards and methods, so as to prevent breakage and the settling of the sewer or drain.

SOIL, WASTE AND VENT PIPES

CHART A.

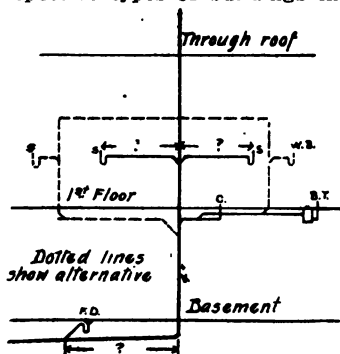
CHART SHOWING KINDS OF FIXTURES, NUMBER OF FIXTURES, SIZES OF TRAPS, DIAMETER OF SOIL, WASTE, AND VENT PIPES.

Kind of fixtures	Soil and Waste		Vent		Sizes of traps required	Maximum developed length of vent pipe permitted **
	No. of fixtures allowed	Sizes of soil and waste	No. of fixtures allowed	Sizes of back vents		
Closets	*	3"	6	2"	2 1/2" to 4"	60
	10	4"	7-10	2 1/2"		80
	11-25	5"	11-20	3"		100
	26-60	6"	21-40	3 1/2"		120
	61-100	8"	41-75	4"		150
	101-175	10"	76-100	6"		250
Slop sink with trap combined	2-	2"	1	1 1/2"	2" to 4"	40
	6-	3"	6	2"		60
	7-15	4"	7-10	2 1/2"		80
	16-36	5"	11-20	3"		100
	37-64	6"	21-	3 1/2"		120
Sinks, bath tubs, laundry trays, ordinary slop sinks Small single urinals and shower baths	1	1 1/2"	4	1 1/2"	1 1/2" or 2"	40
	1-4	2"	5-8	2"		60
	5-6	2 1/2"	9-12	2 1/2"		80
	7-10	3"	13-20	3"		100
	11-15	3 1/2"	21-30	3 1/2"		120
	16-30	4"	31	4"		150
Wash basins, cuspidors, bubblers, refrigerators	1	1 1/4"	2	1 1/4"	1 1/4" or larger	25
	1-4	1 1/2"	2-6	1 1/2"		40
	4-10	2"	6-15	2"		60
	10-25	3"	15-40	3"		100
	25	4"	40-	4"		150
Floor drains	1	2"	6	2"	2" to 6"	60
	1-4	3"	6-10	3"		100
	4-8	4"	10-	4"		150
	8-36	6"				
Bar Connection		1 1/2"		1 1/2"	1 1/2" or larger	40
		to		to		to
		3"		2"		60
Long trough pedestal, combined trap and porcelain stall urinals	1	2"	2	1 1/2"	2" to 4"	40
	1-4	3"	1-4	2"		60
	4-10	4"	4-12	2 1/2"		80
	10-25	5"	12-30	3"		100
	25-	6"	30-	4"		150

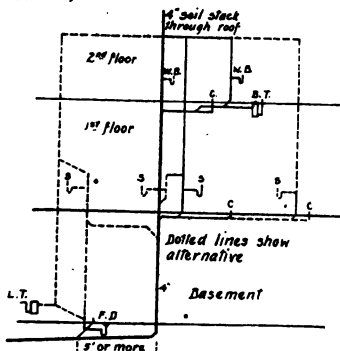
*See section 29 and sketch No. 36.

**After maximum developed length of vent pipe is reached increase diameter of pipe at each multiple of the maximum length permitted.

Note: The vent sizes are intended for individual venting of each fixture trap. In determining the size of the soil and waste pipe given in Chart A, allow, in addition to each closet permitted, one bath, one basin, and one sink or other similar fixture. In determining the size of vent pipe, allow, in addition to each closet permitted, one bath, one basin, and one sink or other similar fixture. (For method of installation, see sketches and Code provisions.) The following sketches (Nos. 7 to 13) illustrate minimum requirements for typical installations in the respective types of buildings indicated.



Sketch No. 7.—Illustrating minimum requirements for typical one-story building installation. (For distances permitted between soil stack and fixture traps, see section 8 and Sketch No. 19.)

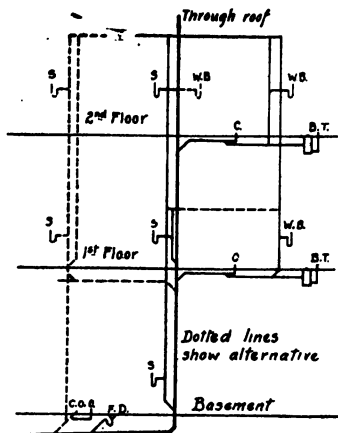


Sketch No. 8.—Illustrating minimum requirements for a two-story residence or similar installation.

Section 5. (a) Soil, Waste and Vent Pipes—How Protected. All main branch, soil, waste, vent and back vent pipes shall be made of cast iron, coated with tar or asphaltum, galvanized wrought iron or galvanized steel pipe, or lead, brass or copper. No galvanized iron or steel drainage, waste or vent pipe shall be laid underground. All lead, galvanized wrought iron or steel water, soil, waste or vent pipes or branches thereof, including traps and connections when installed so as to be embedded or passed through concrete, shall be protected against the corrosive action of such concrete by thoroughly applying one or more than two water-closets paint or adequate tar paper wrapping or both, or by other equivalent means of insulation.

(b) Minimum Size of Vent Stack. Where not more than two water-closets are installed below the first floor and serve as the only closets in the building, the vent pipe shall not be less than two inches. In deter-

mining the size of the vent pipe, allow in addition to the closet, one bath, one basin, one sink or other similar fixture, provided that such vent pipe shall not be used as a waste or wet vent pipe. The size of the vent and waste pipes for

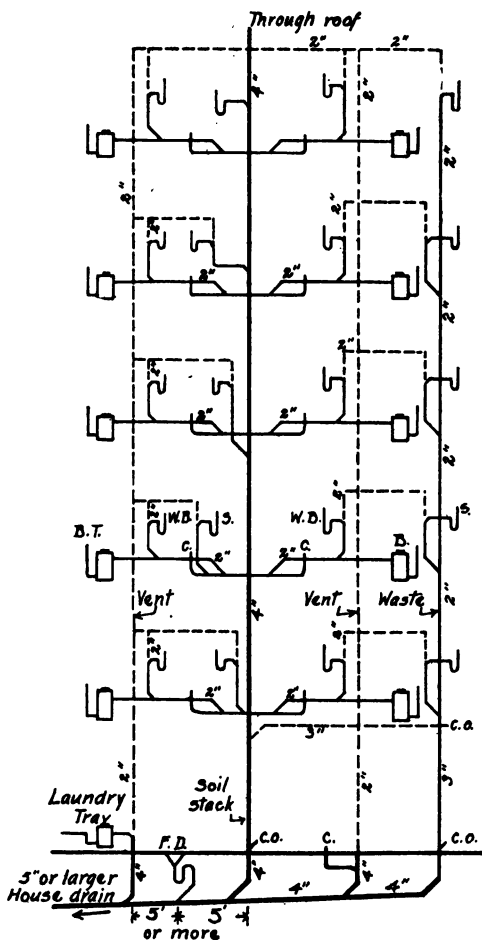


Sketch No. 9.—Illustrating minimum requirements for duplex flat installation.

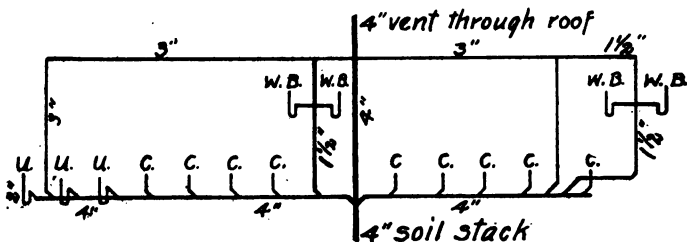
basins, sinks, baths, or other similar fixtures when they serve as the only fixtures in a building shall be governed by the provisions of Chart A.

(c) **Four-Inch Stack May Be Decreased.** A closet may be installed on a 4-inch soil pipe rising from house drain to first or second floor, and may be vented with a 2-inch vent pipe, provided the premises where such closet is to be installed has a 4-inch soil pipe stack of undiminished size extending through the roof. (See Sketch No. 14.)

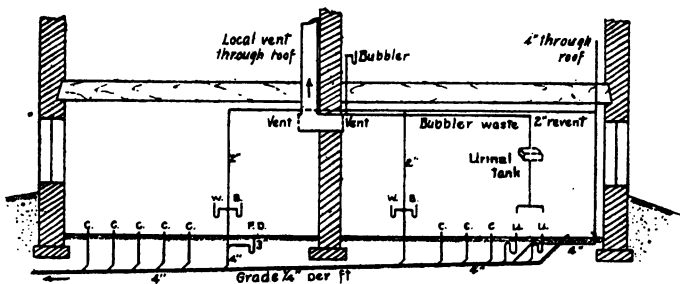
In garages, barns, etc., a closet may be installed on the first or ground floor and may be vented with a 2-inch pipe.



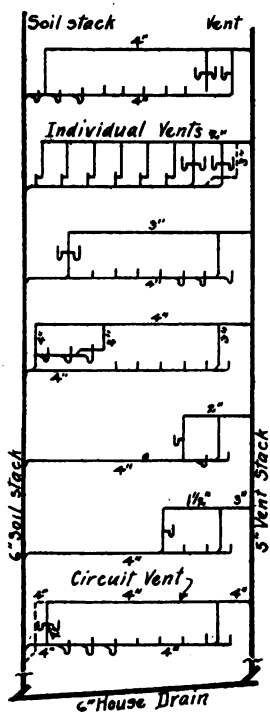
Sketch No. 10.—Showing maximum number of fixtures permitted on a 4-inch soil stack as provided in Chart A, and illustrating the minimum standard and basic principle of re-venting for such installations. For details see various Code sections and sketches.



Sketch No. 11.—Illustrating the maximum number of closets permitted on a 4-inch soil stack when installation is made as shown.

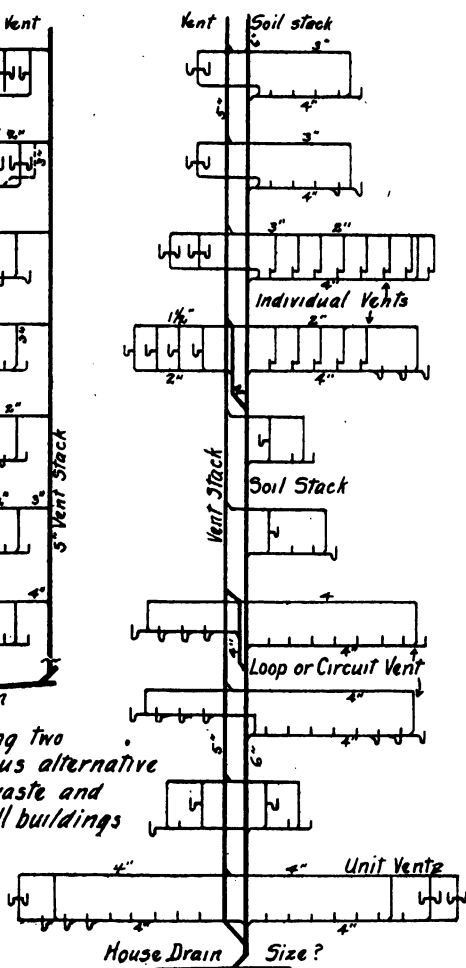


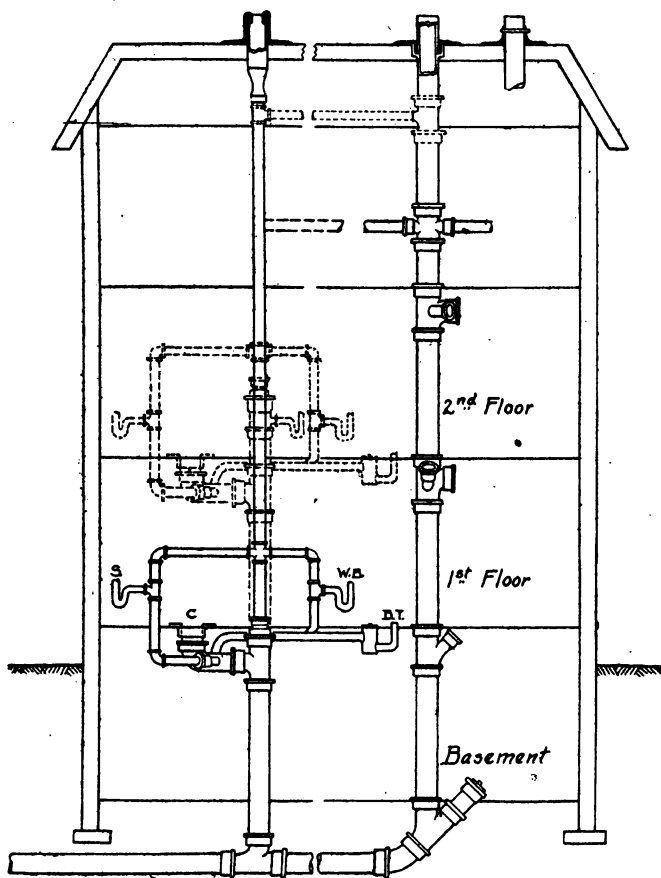
Sketch No. 12.—Showing typical method for a small school building (basement installation), drain connected to public sewer or approved sewage disposal system.



Sketch illustrating two typical and various alternative methods of soil, waste and vent piping for tall buildings

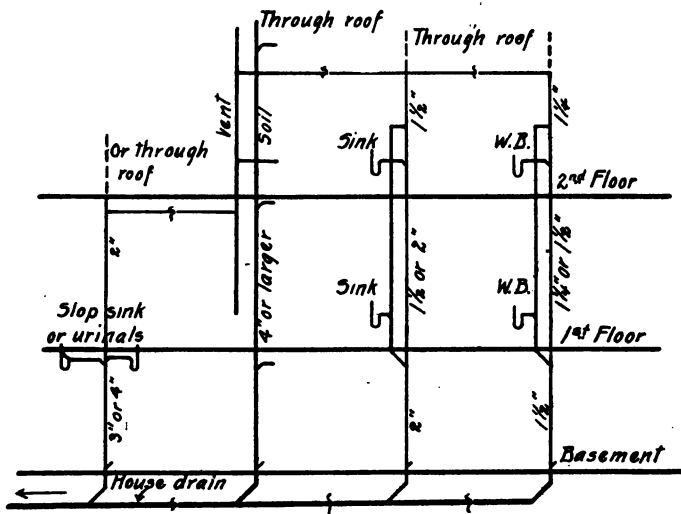
Sketch No 13





Sketch No. 14.—Illustrating provisions of section 5 (c).
(Dotted lines show alternatives.)

Section 6. (a) Roof Extensions. All soil and waste pipes receiving the discharge of any fixtures shall be extended the full calibre above the roof, except as provided for in section 5 (c) and accompanying sketch. (Also see Sketch No. 15.)



Sketch No. 15.—Illustrating permissible decrease of waste stacks and limitations. Sec. 6 (a).

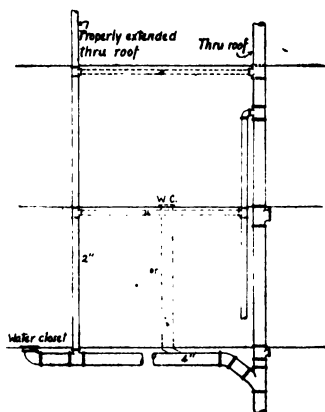
In no case shall a vent pipe through the roof be less than four inches in diameter. The roof terminals of such vent pipes must conform with the provisions of section 32 and sketches accompanying same.

Changes in diameter shall be made by long increaser at least one foot below roof.

(b) Protection From Frost. All drain, soil, waste, or vent and supply pipes shall, unless wholly impracticable, be placed within the walls of buildings and shall be as direct as possible, properly protected from frost and when possible arranged so as to be readily accessible for inspection and repairs.

Water pipe shall be so graded that it may be readily drained.

Section 7. Branch Soil and Waste Extensions. Any branch extending from a soil or waste pipe, running vertically, horizontally, or both, shall be carried full size to fixtures connections and may be vented or revented to conform with the provisions of Chart A. (See Sketch No. 16.)

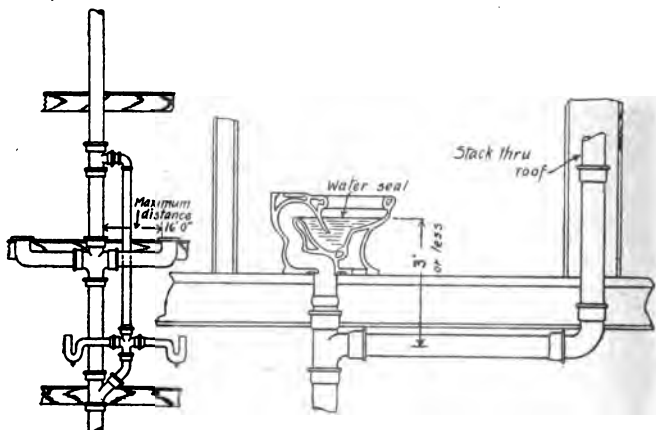


Sketch No. 16.—Showing extension of soil or waste branch. Sec. 7.

sanitary Tee need not be back vented, providing that the developed distance of the horizontal soil branch extended with a grade of not less than one-fourth inch per foot does not

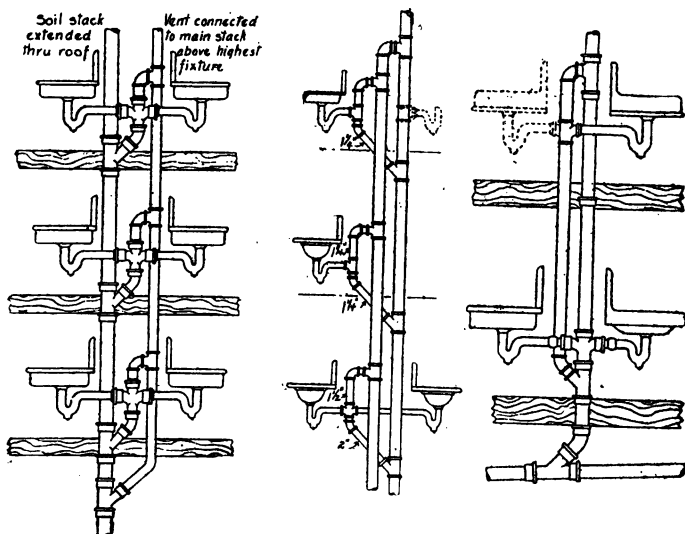
Section 8. (a) Traps, Distance from Vents. The back vent of any fixture trap shall be as close to the trap as practicable consistent with its location and effectiveness. (See sketches.)

(b) Unit Vent. Two water closets located on the same floor discharging into a double Y or sanitary Tee cross or one closet discharging into a Y branch or



Sketch No. 17.—Illustrating provisions of section 8 (b).

exceed the inside diameter of the soil branch and the vertical leg between the horizontal soil branch and the trap water level does not exceed 3 feet. (See Sketches Nos. 17 and 18 and sections 19 c and 61 c.)



Sketch No. 18.—Illustrating provisions of section 8 (c).

(c) **Fixtures Other Than Water-Closets.** Two fixtures other than water-closets discharging into a double Y or sanitary Tee cross or an individual fixture other than water-closet discharging into a Y branch or sanitary Tee with no other fixtures discharging into the same pipe above them (See sketch No. 18), need not be back vented, providing the total fall of the waste pipe between the water level of the trap and the vent pipe extended at a grade of not less than $\frac{1}{4}$ -inch per foot does not exceed the inside diameter of the branch waste pipe. (See also Sketch No. 19 and sections 19 c and 61 c.)

(d) **Crown Vent Prohibited.** In no case shall the vent be taken off from the crown of the trap. (See sketches showing trap revents.)

Sketch No. 19

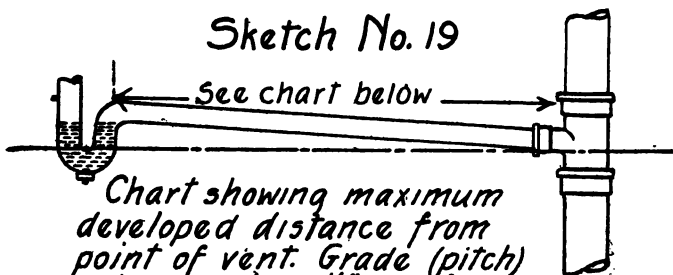


Chart showing maximum developed distance from point of vent. Grade (pitch) not more than $\frac{1}{4}$ " per foot.

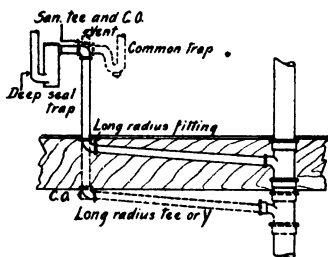
Size of pipe	Max. total grade	Max. developed Dist.
1 $\frac{1}{4}$ in.	1 $\frac{1}{4}$ in	5 ft.
1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	6 ft.
2 "	2 "	8 ft.
3 "	3 "	12 ft.
4 "	4 "	16 ft.

Note: Distances between the trap and vent one half the length of those given in the above chart are recommended. Plumbers should so design and install their work as to conform with this recommendation wherever practicable.

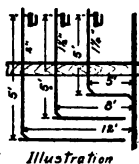
(e) When Deep Seal Resealing Traps of the Centrifugal, Self-Scouring Type May Be Used.

(1) When a common trap is not adequate protection against sewer air.

(2) When the total fall of the soil or waste pipe between the water level of the trap and the point of venting exceeds the inside diameter of the waste pipe, extended at a grade of not less than $\frac{1}{4}$ -inch per foot, provided that the vertical leg between the horizontal waste branch and the trap level of sinks, wash basins and similar fixtures does not exceed five feet and that the total developed length of the entire waste pipe, including the vertical leg, conforms with the provisions as shown in sketch No. 20.



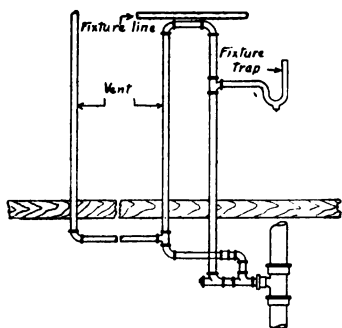
Size of pipe	Max. length of vertical leg	Max. developed length of pipe
1 1/4"	5'	10'
1 1/2"	5'	13'
2"	5'	17'



Sketch No. 20.—Showing methods of installation and indicating limitations on the use of deep seal traps. Sec. 8 (d).

above the point of revent connection. (See sketch accompanying section 32.)

Note: Rules pertaining to the use of deep seal traps are incorporated herein primarily to make provision for installations in old buildings. Consult "Suggestions to the Public" in this Code for particulars as to the necessity of venting and re-venting.



Sketch No. 21.—Illustrating method of installing loop vent. Sec. 8 (h).

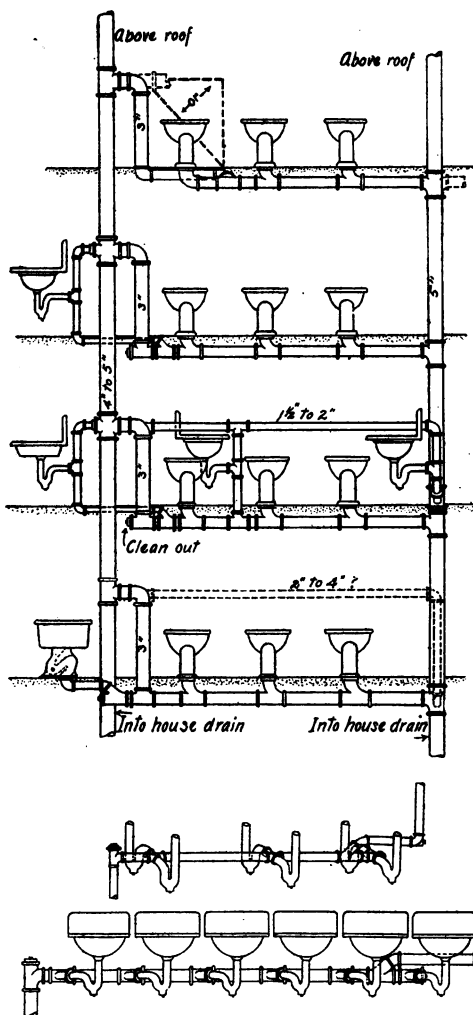
(3) When it is impracticable to vent, a deep seal resealing trap shall be installed. So far as is practical a free circulation of air must be provided. (See also sections 19 and 61c.)

(f) Vents Reconnected.

All vents shall be run separately through the roof; or be reconnected at least eight inches below the roof; or be reconnected to the main vent pipe not less than three feet above the highest floor on which fixtures are placed. No fitting or fittings for future waste connections shall be placed in any soil or waste pipe

(g) **Rearranging of Vent and Revents.** Where fixtures are afterwards installed on a soil or waste line above a point where the vent or revents enter the vent or vent stack, the vent and revent pipes of the fixtures already installed shall be rearranged to conform to the provisions of section 8 (b).

(h) **Vent Pipe Grades and Connections.** All branch



Sketch No. 22.—Illustrating method of circuit or continuous venting. Sec. 9.

vent and back vent pipes shall be free from drops or sags, and shall be so graded and connected as to drip back to the soil or waste pipe by gravity. Whenever it becomes necessary to trap a horizontal vent pipe, it shall be drained back into a waste pipe by gravity. A loop vent may be installed as shown in accompanying sketch. (See sketch No. 21.)

(i) **Fixtures Parted by Wall.** Where bath rooms, water-closets or other fixtures are located on opposite sides of a wall or partition in the same building, or are directly adjacent to each other in two inseparable buildings, such fixtures may have a common soil or waste pipe and vent pipe stack.

Section 9. Continuous or Circuit Vent Installation. Batteries of closets, urinals, sinks, basins, etc., may be installed by the continuous or circuit vent system. Loops and circuit vents shall be of the following sizes: 2 inches for a battery of two closets, 3 inches for a battery of three to six closets, 4 inches for a battery of seven or more. For urinals, sinks, basins or similar fixtures the loop or circuit shall be of the size provided for in Chart A. Methods for such installation are shown in sketch No. 22.

Section 10. Back Vents Not Required. Where a house drain is served by a soil, waste or vent stack at least two inches in diameter, water-closets, not to exceed two in number, basement or cellar floor drains, subsoil traps, elevator catch basins or similar receptacles need not be back vented when branched into horizontal house drain five feet or more in the direction of the flow from the base of a soil or waste pipe stack.

Note: The provisions of Sections 8 (b) and (c) must be carefully observed in installations of this character. For floor drains see provisions of Sections 39-50.

Section 11. (a) Grade of Horizontal Pipes. All horizontal drain, soil and waste pipes shall be run in practical alignment and at the uniform grade of $\frac{1}{4}$ inch per foot or more; but in no case shall the grade be less than $\frac{1}{8}$ inch per foot, whether under cellar floor or supported by piers, posts, wall ledges or iron hangers.

(b) **Changes in Direction.** For information on changes in direction of soil, waste and drain pipes, see Chart C (page 54) and accompanying sketch.

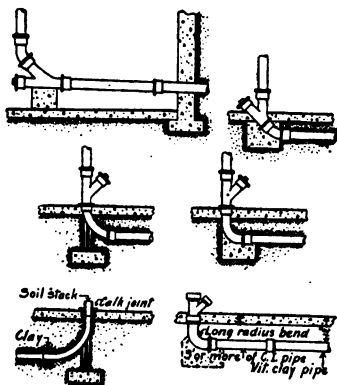
(c) To increase or Reduce Size of Pipes. Proper fittings of sanitary design shall be used to increase or reduce size of pipes.

Section 12. (a) Hangers and Supports. All hangers, pipe supports and fixture settings in or against masonry, concrete

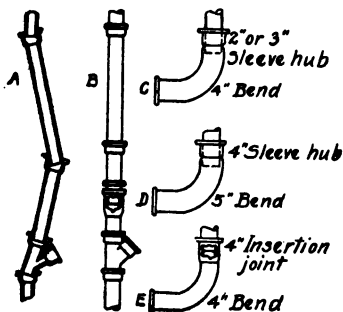
or stone backing shall be securely made with expansion bolts or other approved methods without the use of wood plugs. All drainage and plumbing pipes shall be rigidly secured and supported so that the proper alignment will be retained.

(b) **Backgrounds.** Backgrounds, except under special conditions, must be provided for the securing of closets, tanks, basins, sinks, brackets and all other wall fixtures or hangings.

(c) **Stack Supports.** All stacks shall be thoroughly supported on concrete, masonry piers or foot rests at their bases; and those ten feet or more in height shall also be provided with floor rests or other substantial supports at ten foot or floor intervals. All pipe supports shall be made of heavy iron posts, wall hangers or brackets, steel fittings or concrete or masonry piers. All brick piers shall be at least 8 inches square. (See sketch No. 23.)



Sketch No. 23.—Showing methods of supporting soil pipe stacks at their base. Sec. 12 (c).



Sketch No. 24.—A and B illustrating methods of inserting soil pipe fittings or joining cast iron pipe; C, D and E suggesting methods of connecting soil, waste and vent stacks to underground house stacks. Sec. 12 (c).

Note: In cases where soil, waste or vent stacks are tested separate from the house drain it is important that the connection between the stack and house drain be made carefully and in a manner so as to make for a substantial, properly set, water air-tight joint. For recommendable method see sketch

24.

QUALITY AND WEIGHT OF MATERIALS

Section 13. Vitrified Pipe. All vitrified pipe and fittings shall be first quality vitrified clay pipe, sound and well burned throughout their thickness, with well-glazed smooth exterior and interior surfaces, free from cracks, flaws, blisters, fire checks and all other imperfections which would impair their value.

Section 14. (a) Cast Iron Pipe. All cast iron pipe fittings shall be made of close-grained gray iron, ductile and readily cut with file or chisel, smooth on the inside, free from flaws, sand holes or other defects and of a uniform thickness. Such pipes and fittings shall not be lighter than the commercial grade known as "Standard," except that in buildings three stories or more in height, "extra heavy" soil pipe shall be used.

Note: On account of its greater durability and ease of installation, it is recommended that "extra heavy" cast iron pipe be used in all plumbing systems. Cities by ordinance can require the use of "extra heavy" cast iron pipe and fittings.

(b) Weights of Cast Iron Pipe and Fittings. All cast iron pipe, including hubs, shall weigh not less than the weights per foot given in the following chart:

CHART B.

Diameter	Standard weight per foot	Extra heavy weight per foot
2-inch.....	$3\frac{1}{2}$	$5\frac{1}{2}$ pounds
3-inch.....	$4\frac{1}{2}$	$9\frac{1}{2}$ pounds
4-inch.....	$6\frac{1}{2}$	13 pounds
5-inch.....	$8\frac{3}{8}$	17 pounds
6-inch.....	$10\frac{1}{8}$	20 pounds
7-inch.....	-----	27 pounds
8-inch.....	-----	$33\frac{1}{2}$ pounds

Wall thickness of such fittings and the hubs thereof shall correspond with that of the pipe of the same size and kind.

(c) **Coating for Cast Iron Pipe and Fittings.** All pipe and fittings shall be coated with asphaltum or coal tar pitch. Both pipe and coating shall be heated to a temperature of 300 degrees F. before the castings are dipped.

CHART C.

Showing Radius of Cast Iron Soil Pipe Fittings when Change of Direction Is Made.*

(Case A) When direction of flow changes from horizontal to vertical.

Size of pipe-----	2"	3"	4"	5"	6"
Minimum radius-----	3"	3½"	4"	4½"	5"

(Case B) When direction of flow changes from vertical to horizontal.

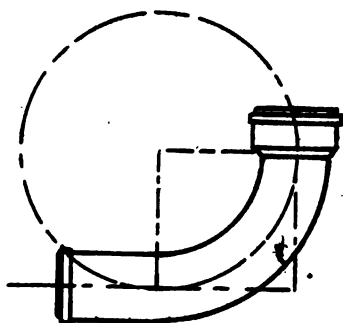
Size of pipe-----	2"	3"	4"	5"	6"
Minimum radius-----	3"	3½"	4"	4½"	5"

(Case C) When direction of flow is at right angles and changes from horizontal to horizontal.

Size of pipe-----	2"	3"	4"	5"	6"
Minimum radius-----	5"	5½"	6"	6½"	7"

Note. A combination Y and ¼ bend or Y and ⅜ bend are recommended. When a pipe of smaller diameter enters a pipe of greater diameter, a fitting with a minimum radius as shown under Case A may be used.

* For method of determining radius see sketch No. 25.



Sketch No. 25.—Showing method of determining radius of bends. Sec. 14, Chart C.

When sanitary Ts or wiped branches are used in change of direction they should be so arranged that the flow from other fixtures will serve as a wash.

Section 15 (a) Wrought Iron Pipe. All wrought iron or steel pipe, known to the trade as merchant or full weight pipe, used for soil, waste or vent pipes, shall be galvanized and not lighter than shown in the following chart:

CHART D.

Diameter.	Weight per lineal foot
1½ inches.....	2.73 pounds
2 inches.....	3.68 pounds
2½ inches.....	5.82 pounds
3 inches.....	7.62 pounds
3½ inches.....	9.20 pounds
4 inches.....	10.89 pounds
4½ inches.....	12.64 pounds
5 inches.....	14.86 pounds
6 inches.....	19.18 pounds
7 inches.....	23.77 pounds
8 inches.....	25.00 pounds

(b) Screw Thread Fittings. Threaded fittings for vents and back vents shall be cast iron, galvanized malleable iron, or brass.

All screw thread fittings used for soil and waste pipes shall be of cast iron, galvanized malleable iron or brass. Waste fittings shall be of the recessed, drainage fitting pattern; and

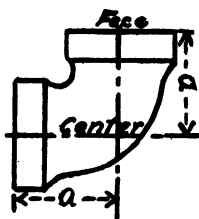
the same rules for change of direction given in charts C and E will apply. All iron screw thread fittings for soil or waste pipes shall be galvanized or asphaltum coated.

CHART E.

Showing the Minimum Length of Face to Center of Drainage Fittings.

Size of pipe ----	1¼"	1½"	2"	2½"	3"	4"	5"	6"
Distance from face to center (A) ----	2¼"	2½"	3⅛"	3⅛"	4¼"	5⅜"	6⅛"	7⅛"

Note: Long turn Y branches or Y and ⅓ bend are recommended.



Sketch No. 26.—
Showing method of
determining radius
of screw thread
drainage fittings. Sec.
15, Chart E.

Note: If for construction reasons the use of minimum radius fittings shown in Chart E is impractical, fittings of shorter radius may be used.

Section 16. Prohibited Fittings. Sanitary Tees of short radius shall not be used except in connecting horizontal to vertical soil or waste pipes in which the flow is toward the vertical line. The use of one-fourth bends or elbows in soil or waste pipes is governed by charts C and E and sketch No. 25.

One-fourth bends with side or heel outlets except when they are made with Y or sanitary T branches, and all double hub fittings, double Tees and double sanitary Tees when used horizontally are prohibited, except when smaller pipes discharge into a larger pipe. Double hubs and double hub fittings may be used on rain water leader and vent lines. Offsets having less than one-fifth pitch will not be permitted. The use of a drive ferule is prohibited and the use of combination lead ferrules will be permitted only when the calk joint can be made in the upright position.

All waste and vent pipes must enter soil pipe by means of properly inserted fittings.

The drilling and tapping of soil, vent and waste pipes and house drains to receive waste and vent pipes of any description is strictly prohibited, and in no case will the use of saddles or bands be permitted, without permission from the plumbing inspector.

Note: All such saddles must be of efficient design and construction.

Whenever horizontal wrought or galvanized iron pipe connects with cast iron, soil, waste or vent lines, tapped fittings or tap extension pieces shall be used wherever practicable. No double hub or inverted calk joint shall be permitted in soil and waste lines.

Section 17. Lead Pipe Bends and Traps, Weight of. All pipe used for branch soil, waste, vent or flush pipes, including bends and traps, shall be the best quality of drawn lead pipe, of not less weight per lineal foot than shown in the following table:

CHART F.

Inside Diameter	Weight per foot
1 inch-----	2 lb. 0 oz.
1¼ inch-----	2 " 8 "
1½ inch-----	3 " 8 "
2 inch-----	4 " 0 "
3 inch-----	6 " 0 "
4 inch-----	8 " 0 "

Section 18. Brass Pipe, Fittings, Tubing and Casting.

(a) **Brass Pipe.** All brass pipe used for soil, waste and vents, except fixtures, traps and overflows, shall be of commercial iron pipe gauge.

(b) **Brass Fittings.** All brass fittings for soil, waste or vent pipes shall be of a good quality of cast brass, having a thickness corresponding to the brass pipe of the same diameter.

The thickness of threaded ends must be equal to the thickness of the corresponding pipe size at the root of the thread.

(c) **Brass Tubing.** All brass tubing used for fixtures, traps and overflows between wall or floor and fixtures shall be made of a good quality of brass and of a thickness at least equal to No. 18 Brown & Sharp gauge.

(d) **Traps and Overflows.** All brass fittings used for fixtures, traps and overflows shall be of a good quality of brass, free from sand holes, flaws or other defects, and of a uniform thickness equal to twice the thickness of the brass tubing. The thickness of the threaded ends shall be equal to the thickness of the fitting at the root of the thread.

(e) **Soldering Nipples.** Soldering nipples shall be of heavy cast brass, or of brass pipe of iron weight, thickness and size. When cast they shall be of full bore and of not less than the weights given in the following chart:

Weight of Soldering Nipples.

CHART G.

Inside Diameter	Weight
1¼ inch.....	0 lb. 6 oz.
1½ inch.....	0 " 8 "
2 inch.....	0 " 14 "
2½ inch.....	1 " 6 "
3 inch.....	2 " 6 "
4 inch.....	3 " 8 "

Weight of Brass Ferrules.

Brass ferrules shall be of a good quality of brass, composed of a mixture that will fuse readily with plumbers' solder, free from sand holes, flaws or other defects, uniform in thickness, and at least four and one-half inches long, of a size and weight as per the following chart:

CHART H.

Inside Diameter	Weight
1½ inch-----	1 lb. 1 oz.
2 inch-----	1 " 4 "
3 inch-----	1 " 14 "
4 inch-----	2 " 8 "
5 inch-----	3 " 0 "
6 inch-----	3 " 8 "

TRAPS AND CLEAN-OUTS

Section 19. (a) Traps. Each fixture, except those wasting as described in this section, shall be separately trapped by a water seal trap, placed as close to the fixture as possible.

Every trap shall be self-cleaning. No form of trap shall be used which depends upon the action of movable parts for its seal.

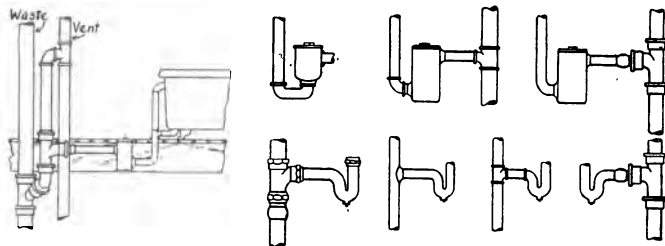
No trap shall be used which depends upon concealed interior partitions for its seal, unless such interior partitions are made of indestructible material.

No trap shall be used which in case of defect would allow the passage of sewer air.

Grease traps with integral cast partitions of indestructible material may be used.

Drum traps not less than four inches in diameter and having a seal of not less than two inches shall be used under all bath tubs and shower baths, wherever practicable.

Traps for bath tubs, basins, sinks or other similar fixtures shall be made of lead, brass or iron. For depth of trap seals see Chart I and for size see Chart A. Each trap shall have a water seal of not less than two inches. Laundry trays, wash tubs, or similar fixtures may waste into single traps. The outlet waste pipe and trap of three or four compartments should be at least 2 inches in diameter.



Sketch No. 27.—Showing typical traps and methods of back-venting. Sec. 19 (a).

CHART I.

DEPTH OF SEAL FOR COMMON TRAPS

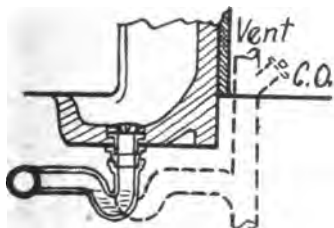
Size of Trap----	1¼"	1½"	2"	3"	4"	5"	6"
Depth of Seal--	2"	2"	2"	2"	2"	2"	2"

DEPTH OF SEAL FOR DEEP SEAL TRAPS

Size of Trap----	1¼"	1½"	2"	3"	4"	5"	6"
Depth of Seal---	4"	4"	4"	4"	4"	4"	4"

(b) **Trap Clean-outs.** All traps shall be equipped with adequate brass screw clean-out plugs or covers, readily accessible, except those which are integral parts of fixtures.

Traps for urinals rising from the floor and those serving shower baths and floor drains may be installed as shown in sketch No. 28.



Sketch No. 28.—Illustrating trap in connection with urinal rising from the floor. Sec. 19 (b).

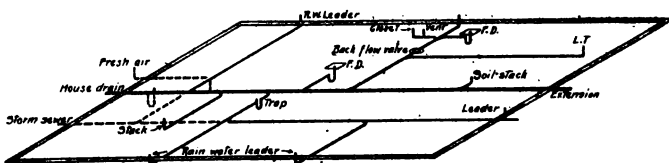
level of the trap and vent shall not exceed the inside diameter of the waste pipe. (See section 8.)

(c) **Setting of Traps.** All traps shall be rigidly supported and set true with respect to their water level, and so located as to protect their seals. All that portion of the waste pipe of P trap extending to the point of venting shall be considered as a part of the trap and the total fall between water

(d) **Traps—Where Prohibited.** There shall be no trap at the foot of soil or waste pipe stacks, except where such a

drain or sewer is used exclusively for conducting rain water or surface water to a house drain or sewer.

(e) **Traps for Rain Water Leaders.** One trap may serve for one or more rain water leaders, providing no part of said pipe is used for a soil or waste pipe. When rain water leaders are carried up to the roof of a building they need not be provided with traps, unless such conductors terminate within 12 feet of any door, window, ventilating hood or air intake. Connections for roof leaders inserted between main in street and main house trap, where such house trap is installed, shall be separately and effectively trapped, the traps to be so located as to insure them against frost. (See Sketch No. 29.)



Sketch No. 29.—Outline plan of a combination house drain and showing when necessary to install the location of back flow valve. Dotted lines show alternatives, main house trap, fresh air inlet and separate storm sewer. Section 19 (e).

(f) **Other Waste Connected to Water-Closet Trap Prohibited.** In no case shall the waste from a bath tub or other fixture be connected with a water-closet trap.

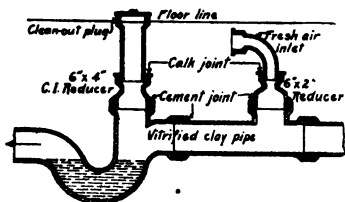
(g) **Overflow Connections.** Overflow pipes from fixtures in each case shall be connected on the inlet side of the trap.

Section 20. (a) Main House Trap. The house drain may be provided with a horizontal trap set level and placed immediately inside of foundation wall where sewer enters building. This trap must be provided with a handhole to which clean-out is connected.

Main house trap may be omitted in building where the roof terminals of soil and vent stacks are favorably located, when plumbing is free from defects, fixture traps properly protected from siphonage, and the installation made in a durable and sanitary manner, as provided for in this Code.

When main traps are used they must be provided with a fresh air inlet on the house side of the trap. (See sketches Nos. 29 and 30.)

(b) **Fresh Air Inlets Where Main House Traps Are Used.** There shall be a fresh air inlet entering the house side at least two feet from the water seal of the main trap. The



inlet when exposed shall be covered with a substantial fresh air cap or return bend. When located under porch a free circulation of air must be provided.

Sketch No. 30.—Illustrating vitrified clay main house trap, clean-out, and fresh air inlet installation. Section 20 (a).

(c) **Location of.** No fresh air inlet shall be so placed that a cold air intake for a furnace or heater may draw air from same; nor shall it be open at a point less than four feet from any door, window or other air intake.

Note: Public or private sewerage and drainage systems within the building should be so designed, constructed and maintained as to provide for a free circulation of air or effective ventilation throughout the system, thus reducing the pernicious effects of sewer gas on the materials to a minimum.

Based upon present day knowledge it would appear that the indiscriminate installation of main house traps is one of the greatest mistakes, if not the greatest, in the development of the high grade modern plumbing system. Therefore, every effort should be made by all interested to accomplish a satisfactory correction of this condition. The main house trap may be safely omitted.

(a) from all plumbing installations in new public sewerage systems and from all extensions of existing systems in outlying districts.

(b) from all buildings where roof terminals of soil, waste and vent pipes are located a safe distance from windows, doors, or any source of air intake, etc.

(c) providing the plumbing and drainage installation within the building is made and maintained in compliance with good plumbing practice.

The chief objections to the main house trap may be briefly noted as follows:

Because it retards the flow of sewage and thus acts as an accessory to house drain stoppages.

Because it serves as one of the principal "sewer gas" producing agents.

Because it is an effective barrier making for the prevention of proper ventilation of both the sewerage and building drainage systems.

Because it adds to the initial and maintenance costs of the installation without giving value in return.

Because its use is not necessary except in some isolated cases.

Because it has been conclusively proven that well-ventilated sewerage and drainage systems are practically free from dangerous sewer gas. The main house trap as the term applies stops the flow of air in either direction and thus prevents proper ventilation—the first essential requirement of a modern high grade plumbing system.

Therefore its indiscriminate use should be prohibited.

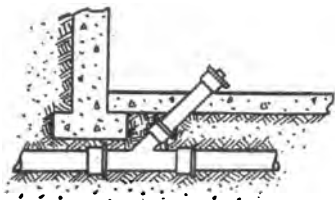
Section 21. Back Flow Valves. Drain pipes from fixtures shall be provided with adequate backwater valves when subject to back flow or backwater from sewer. Such backwater valves shall be so placed as not to interfere with the flow or discharge of any conductor or rain water leader or other fixture, and be readily accessible for cleaning, and means for a free circulation of air shall be provided by an adequate revent pipe or fresh air inlet, as the case may require.

Note: Care should be exercised in the design of the underground piping in house drains subject to back flow. For economy in installation, basement fixtures should be located and closely grouped on an independent branch receiving the waste from such fixtures only. (See sketch No. 29.)

Section 22. (a) Clean-outs. Where main house traps are installed, cast iron pipe shall be extended from handhole of trap to a point two inches above the surface of finished floor or grade. All clean-outs in house drains shall be at least four inches in diameter. (See Sketch No. 30.)

Where no main house trap is installed a four-inch clean-out shall be provided on the house drain at a point where it leaves the building. (See Sketch No. 31.)

All additional clean-outs for main house drain shall be extended where practicable to a point two inches above the surface of the finished floor or grade, and be of adequate size and so installed as to serve the purpose for which they are intended.



Sketch No. 31.—Illustrating main house drain clean-out plug. Sec. 22 (a).

At least one clean-out shall be provided on horizontal sink or similar waste lines, and in cases where changes in direction occur additional clean-outs shall

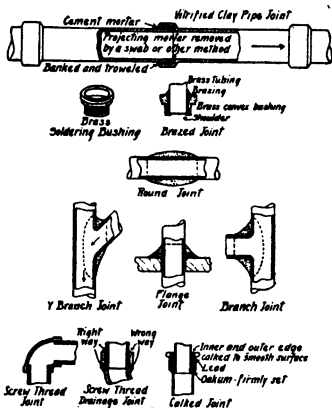
be installed, all so located that they are accessible and serve the purpose for which they are intended. (See sketches.) All soil and waste stacks so constructed that stoppages are liable to occur at their base shall be provided with clean-out plugs.

(b) **Construction of Clean-outs.** When solid brass screw caps for clean-outs are used, they shall be at least $\frac{1}{8}$ -inch in thickness and provided with standard pipe thread and square or hexagonal head at least $\frac{3}{4}$ -inch high. The ferrule when constructed of brass shall be at least $\frac{3}{16}$ -inch in thickness; and when constructed of iron the same weight per foot as extra heavy cast iron soil pipe. The screw cap shall have at least five threads of iron pipe size.

Note: Clean-outs should be provided in connection with all urinals at such points that all parts of the waste pipe may be reached conveniently with sewer rod or wire.

JOINTS AND CONNECTIONS

Section 23. (a) Joints in Vitrified Pipe. Joints in vitrified pipes shall be made with mortar composed of equal parts of hydraulic or Portland cement and clean sharp sand, thoroughly mixed dry, with enough water added to give the proper consistency. The joints must be pointed carefully on the outside; and the pipe left clean and smooth on the inside by drawing through it a swab or scrape.



Sketch No. 32.—Showing methods of making joints in vitrified clay pipe, cast iron soil pipe, screw thread pipe, wiped joints in lead pipe, and brazed joints in connection with traps. Sec. 23 (a).

(d) Wrought Iron and Brass. Joints in galvanized iron or brass pipe shall be standard screw joints, and all burs or cuttings shall be removed. All screw joints shall be made with white or red lead, mineral paint, red lead and varnish or other approved compounds.

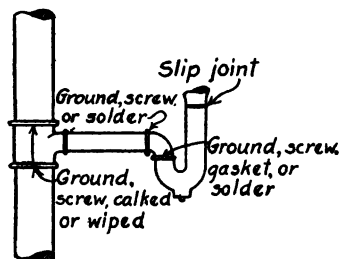
(b) Vitrified and Iron Pipe. Underground joints between vitrified and iron pipe shall be made the same as above required for vitrified pipe.

(c) Cast Iron Pipe. All joints in cast iron pipe shall be made by first inserting a roll of hemp, oakum or jute and thoroughly calking it in place, and then following with pure molten lead well calked, not less than one inch deep, lead to be brought to top of hub and faced. No paint, varnish or putty will be allowed in the joints until they have been tested.

(e) **Wrought Iron or Brass and Cast Iron.** Connections between wrought iron or brass and cast iron shall be either a calked joint or a screw joint.

(f) **Joints in Lead Pipe.** Joints in lead pipe or between lead, brass or copper pipes shall in all cases be wiped joints except solder brazed or sweated joints on brass reamed concaved bushings in connection with exposed brass or lead traps. (See Sketch No. 33.)

(g) **Wrought Iron Pipe Connections.** Connections between lead and cast or wrought iron pipes shall be made with a



calked joint, a soldering nipple or threaded joint. Wrought iron pipe connections shall be made with a right and left coupling, flanged union with durable gasket, a ground faced union or an extra heavy running thread with lock nut made tight with wicking and red or white lead.

Sketch No. 33.—Showing permissible joints in connection with traps. Sec. 23 (f).

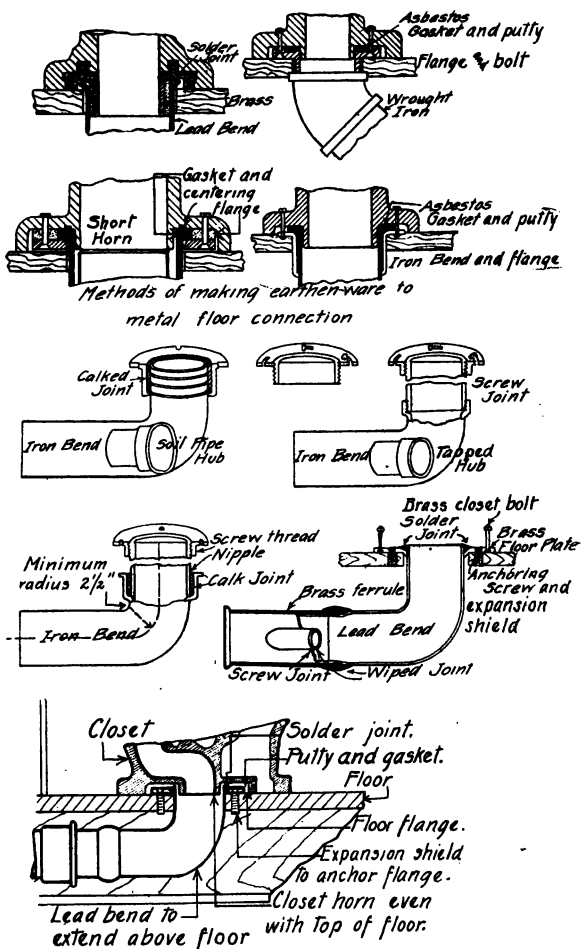
All unions used on the

sewer side of traps shall be ground faced. No slip-joint connection will be allowed on the sewer side of the trap. (See Sketch No. 33.)

Section 24. (a) Roof Joints. The joint at the roof shall be made water-tight by the use of proper sheet copper or lead plate. (See section 28f.)

(b) **Roof Flashing.** Sheet lead for roof flashing shall weigh not less than three pounds per square foot and shall extend not less than six inches from the pipe. Other flashings of substantial material will be permitted. (See Sketch 14 and Section 5c.)

Note: Roof flashings of durable material designed and constructed so that an adequate air space is provided between the pipe and flashing are recommended. The term substantial material as used in this section shall mean 3 lb. sheet lead, or copper, brass or galvanized iron of adequate weight and construction.



Sketch No 34.—Illustrating method of making earthenware floor connection, closet bowl or similar fixture. Sec. 25.

Section 25. Earthenware with Metal Floor Connections. The connections between soil pipe and fixtures with combined earthenware, vitreous china or enameled iron shall be made with a solid brass floor plate, not less than $\frac{3}{16}$ -inch thick, soldered, screwed or calked to bend or pipe, securely anchored to the floor and bolted to trap flange. (See Sketch No. 34.)

Joints shall be made air-tight with an adequate asbestos graphite ring or asbestos gasket washer. To insure the tightness of this joint a paste of red or white lead or other equal compound of the consistency of putty, shall be used.

Note: Add sufficient putty or whiting to the red lead to make the proper mixture. (For such fittings and joints see sketch No. 34.)

Section 26. Water and Air-tight Joints. All joints and connections mentioned under this title shall be made water and air-tight.

Section 27. Connections to Lead Bend. It is recommended that no waste pipes conveying hot water be branched into lead bends receiving the discharge of water-closets or other similar fixtures, except in case new fixtures are added to old installations. (For method of installation see Sketch No. 34.)

SURFACE AND RAIN WATER CONNECTIONS

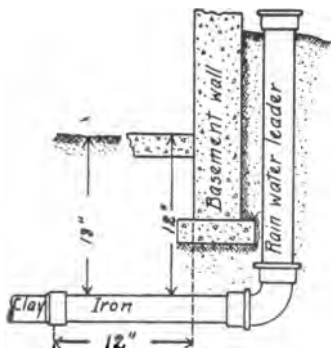
Section 28. (a) Rain Water Leaders Not to Connect to Sanitary Sewer. Roof leaders or down-spout wastes and surface and ground water drains shall be connected wherever possible with a storm sewer; but they shall not be connected to house sewers which discharge into sanitary sewers.

(b) Inside Leaders. All roof leaders placed within the walls of any building, in an interior court, ventilating or pipe shaft, shall be installed as specified for soil, waste and vent pipes when connected to a combination sewer or drain.

(c) Rain Water Connected to Storm Sewers. Rain water leaders within the building connecting to storm sewers shall be treated in the same manner as those entering a combination system, except that pipe used in construction may be cast iron, galvanized, asphaltum coated or black iron pipe.

(d) Connections with Rain Water Leaders—When Prohibited. Rain water leaders shall not be used as soil, waste or

vent pipes; nor shall any soil, waste or vent pipes be used as rain water leaders.



Sketch No. 35.—Illustrating method of installing rain water leaders. Sec. 28 (f).

are connected to house drains within the building, the horizontal part extending two feet inside the basement wall and

(e) Defective Rain Water Leaders. When an existing rain water leader within the walls of any building becomes defective, such leader shall be replaced by one which conforms to the requirements of this Code.

(f) Rain Water Leaders When Connected to Drains. When rain water leaders

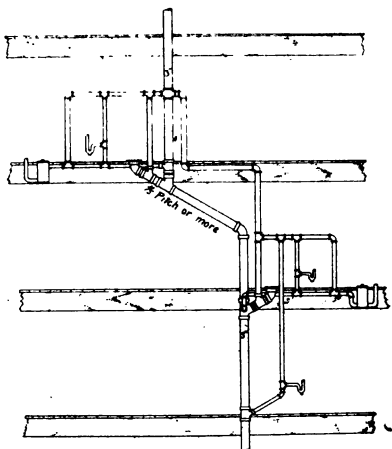
the vertical portion outside the building wall shall terminate with the hub at grade line, and shall be made of cast iron of same weight and durability as provided for house drains. (See Sketch No. 35.)

(g) **Roof Terminal Connections.** Connections between gutters, troughs, roof areas and rain water leaders inside the building shall be made of durable material. (See Section 19e; also Sketch No. 29.)

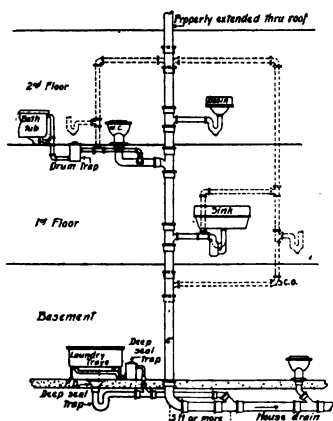
Note: The term "durable" material as used in this section shall mean a brass ferrule, a brass soldering nipple, extra light lead pipe, 12 oz. copper, No. 18 gauge brass or cast iron receivers properly connected with calk or screw joints.

(h) **Rain Water Drains to Curb.** Where no storm sewer is accessible or where rain water is prohibited from entering the sanitary sewer, surface inlets and rain water conductors should be drained separately to the curb line where practicable by drain pipes not less than four inches in diameter, and discharge into the public gutter, unless permitted to drain elsewhere.

MISCELLANEOUS PROVISIONS



Sketch No. 36.—Showing design of 3-inch soil stack installation. Sec. 29.



Sketch No. 37.—Illustrating drainage and vent piping requirements. For water supply and sewage disposal, see sections 56, 57 and 58 and "Suggested Methods."

Section 29. Three Inch Soil Stack. Where a 3-inch soil pipe stack is in place, or where it is wholly impracticable to use a 4-inch soil pipe for water-closets, a 3-inch soil pipe may be used for vertical stacks which shall conform in construction with sketch No. 36, also Chart A (page 38).

Section 30. Small Residence Installations. Where plumbing is to be installed in a small residence draining into a residential sewage disposal or other terminal, it may be installed in accordance with Sketch No. 37.

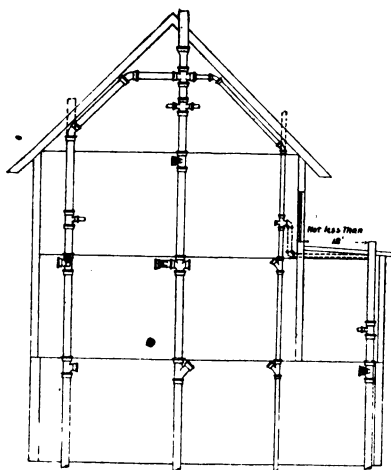
Every fixture trap shall be protected from siphonage and air circulation assured by means of a fresh air inlet and revents where necessary.

Section 31. Hot Water and Steam Wastes. All exhaust, blow-off, sediment or drip pipe connections from a steam boiler or any other hot water discharge shall not be connected to any

house sewer or drain without first being cooled below a temperature of 140 degrees Fah. in a suitable tank, catch basin or other cooling device; when necessary such installation must be provided with an adequate local vent or relief pipe, extended to the outer air.

Note: The capacity of the catch basin or other cooling device and the relief pipe shall depend upon the steam pressure carried, the size of the boiler, and method of operation. The capacity of such basins shall be sufficient to hold at least one gauge of the boiler, and no such appliance should be installed without having been approved by the plumber.

Section 32. Terminals. The roof terminals of all vent pipes shall be extended at least three feet above any door,



Sketch No. 38.—Showing permissible roof terminals and distance from window. Sec. 32.

window, scuttle, air shaft or other opening used for ventilation when located at a distance less than twelve feet from such terminal. (See Sketch No. 38.) When it is necessary to extend the roof terminals of soil, waste or vent pipes more than three feet above the roof, they shall have an adequate frost-proof covering.

Whenever a new building is erected higher than an adjacent existing building, the owner of the new building shall not locate windows within twelve feet of an existing vent stack on the lower building, unless the owner of such new building shall defray the expenses or shall himself make alteration necessary to conform with this section.

Section 33. Waste Pipes for Acid Tanks. The waste pipes and traps for acid tanks, sinks and other receptacles receiving the discharge of acids in chemical laboratories, electro-

typing, lithographing and other similar establishments must be made of extra heavy cast iron, coated inside and out with tar and asphaltum, extra heavy lead pipe, or lead-lined iron pipe of adequate durability. The waste pipes when serving as a local conveyor between acid tank, dilution tank, or other receiving basin may be of vitrified clay incased in concrete of substantial construction and provided with a vent pipe to the open air where necessary.

CATCH BASINS, SUMPS AND EJECTORS

Section 34. (a) Grease Catch Basins. All grease catch basins shall be constructed in a water-tight and substantial manner of brick, cement, concrete, iron or vitrified clay pipe. The outlet shall be provided with a 4-inch inverted bend and clean-out, shall be submerged at least 8 inches and shall be placed in the wall of the basin not less than 2' 6" above the bottom. The basin shall have an air-tight stone, cement or cast iron cover.

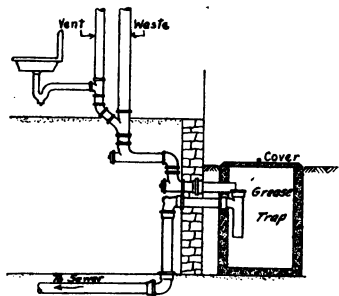
(b) Where Used. Grease catch basins of adequate capacity must be installed wherever kitchen or other greasy wastes from hotels, restaurants, club houses, public institutions or similar places are discharged into the sewer. Grease catch basins may be omitted from the plumbing system of a private residence.

Note: Grease traps of the water-cooled type properly designed, constructed and installed and of adequate capacity are permitted.

(c) Where Located. Whenever possible, grease catch basins shall be installed just outside the wall of the building, and as near to the kitchen or other sink as possible.

Where grease catch basins are installed on the inside of buildings they shall be made of cast iron or reinforced concrete with air-tight iron cover.

Concrete catch basins shall have a metal ring embedded in the concrete to which cover may be bolted. (See sketch No. 39.)



Sketch No. 39.—Showing design of drainage piping and grease basin. Sec. 34 (c).

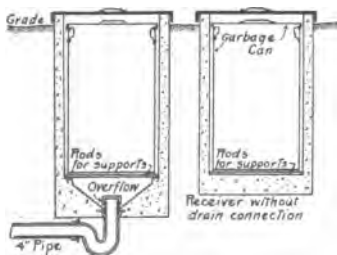
Section 35. (a) Yard Catch Basins. A yard catch basin shall be constructed in the same general manner as provided for grease catch basins, except that they shall be at least 20 inches in diameter and where possible the outlet shall be at least 4 feet below the surface of the ground. The basin shall have a cover of stone or heavy cast iron with strainer flush with the surrounding ground. (See sketch No. 40).

A yard catch basin may be installed to receive surface drainage or discharge pump, yard, hydrant or other outside waste.

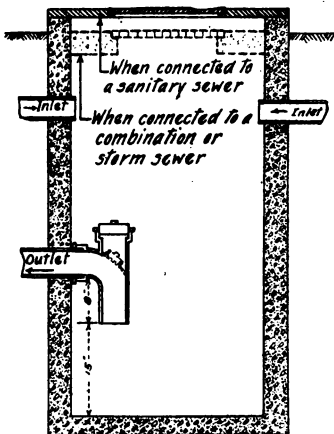
(b) Outdoor garbage can receivers may be installed as shown in the following sketch (No. 41).

Section 36. Stable Catch Basins. When liquid wastes from barns, stables, manure pits and stable yards are permitted to enter the public sewer system, they shall be intercepted by a properly trapped catch basin of suitable design.

Conductors or down spouts when permitted in a sewerage system may be connected with such stable or barn catch basins to act as local vents for same. (See sketch No. 40).



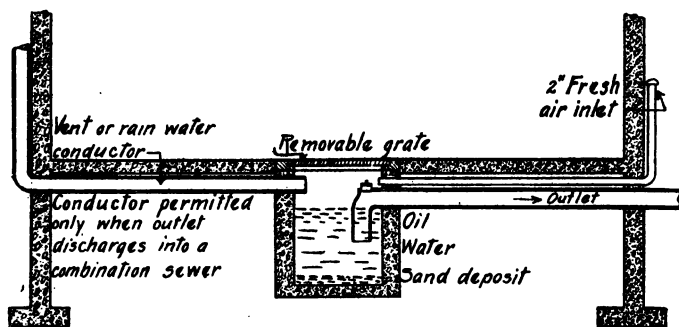
Sketch No. 41.—Illustrating a garbage can receiver and method of connecting with drainage system. Sec. 35 (b).



Sketch No. 40.—Showing typical outdoor catch basin. Sec. 35 (a).

Section 37. Garage Catch Basins. Garage drains shall be intercepted before entering the sewer by a suitable catch basin properly trapped. A 4-inch conductor pipe when permitted to connect with house drainage or

sewerage system may be connected to this catch basin to act as a local vent. In the absence of the latter, a 4-inch fresh air inlet from the outer air or a local vent through the roof is recommended. (See sketch No. 42).



Sketch No. 42.—Showing a method recommended for installing garage catch basin. Sec. 36.

It is recommended that garage drains discharge into yard catch basins constructed in the manner provided for in section No. 35, and accompanying sketch.

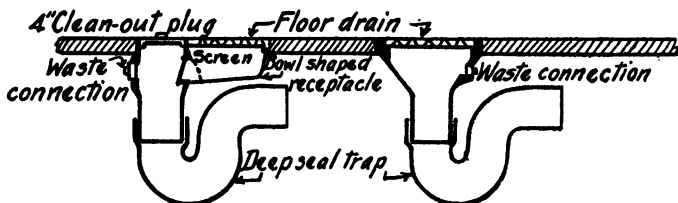
Note: Grease, yard, stable and garage catch basins and other similar receptacles must be kept clean and sanitary. The sediment collected in the same must be removed often enough to prevent obstruction of the drainage pipes.

Section 38. (a) Ejectors—When Required. In all buildings in which the whole or a part of the drainage and plumbing system thereof lies below the flow line of the main sewer, the sewage or house wastes shall be lifted by artificial means and discharged into the main sewer.

(b) Sumps and Receiving Tanks. All house drains discharging below the flow line of the main sewer shall be connected to a sump of adequate capacity with air-tight cover. It shall be so located as to receive all such drainage by gravity and shall be vented with an adequate vent pipe.

FLOOR DRAINS AND FIXTURE WASTES

Section 39. Basement Floor Drains. Cellar or basement floor drains will not be permitted unless they connect into a deep seal trap so constructed that it can be readily cleaned and of a size to serve efficiently the purpose for which it is intended and so located that it is at all times in full view. (See section 10 and sketch No. 43.)



Sketch No. 43.—Showing typical floor drains. Sec. 39.

When subject to back flow such drains shall be equipped also with an adequate back water valve. (See section 21.)

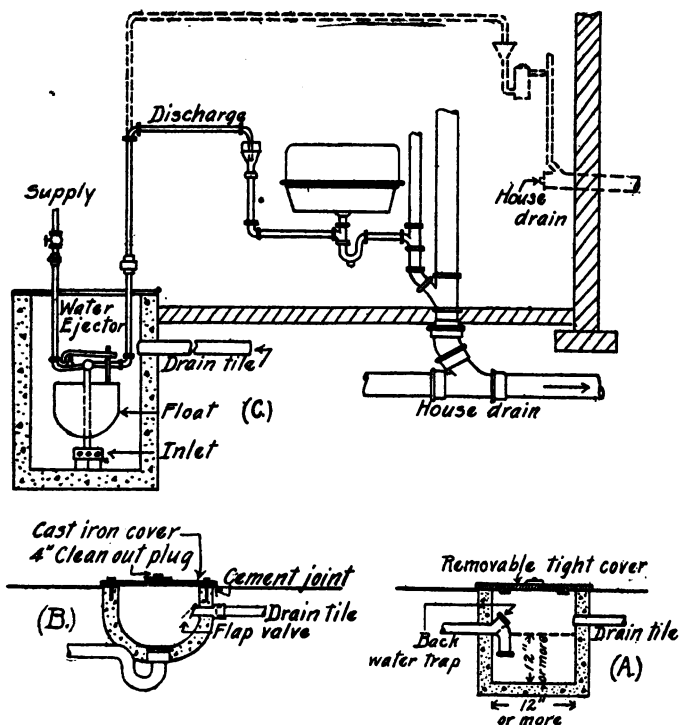
Note: When possible ice box drains, bubblers and similar wastes shall be connected with the floor drain so as to maintain a permanent water seal. Floor drains are subject to stoppages, the trap should therefore be not less than 3 inches in diameter. (For method of installation see sketch No. 43.)

Section 40. Subsoil Receiver. The discharge of drain tile from footings of buildings shall be collected in a subsoil receiver or trap, of adequate capacity, having a water-tight cover securely bolted or screwed on. Said cover shall be at least 2 inches above basement floor. (See sketch No. 44.)

Note: Subsoil drainage frequently carries sand from surrounding soil. For this reason care should be taken that the tile is not so installed that it will undermine the footings of foundation walls. When subsoil drains are connected to the sewerage system subject to back flow, such drains must be equipped with an adequate back water valve.

Section 41. Wastes from Laundries and Similar Establishments. Waste pipes in dye houses, breweries, bottling works, creameries, laundries and similar establishments where much water is used may discharge directly onto a non-absorbent floor, provided with an adequate number of floor drains, which drains must be connected to the house or yard catch basin by means of cast iron or vitrified pipe. Gutters that can be

easily cleaned and kept in efficient operating condition may be provided for collecting and conducting wastes to floor drains, equipped where necessary with a suitable screen for

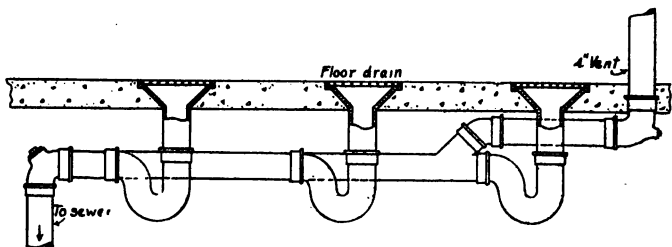


Sketch No. 44.—Showing subsoil receiver and methods of installation. Sec. 40.

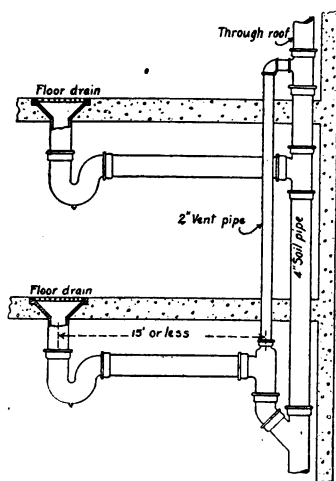
arresting the coarser materials that would otherwise enter the system.

Floor drains located above basement floor shall be considered a plumbing fixture and shall be of adequate size. (For a method of installation see sketches Nos. 45 and 46.)

Note: To avoid the formation of soapsuds in the pipes, waste water from laundries and similar industries located above basement floor shall have an independent waste pipe.



Sketch No. 45.—Showing continuous waste and vent method of floor drain installation. Sec. 41.



Sketch No. 46—Illustrating individual vent method of installing a floor drain. (Sec. 41.)

Section 42. Bar Wastes.

Bar, soda fountain and similar wastes may be installed in accordance with one of the methods shown in sketch No. 47.

The trap, waste and vent pipe may be located at either side of the bar or at any convenient point at the side of the bar.

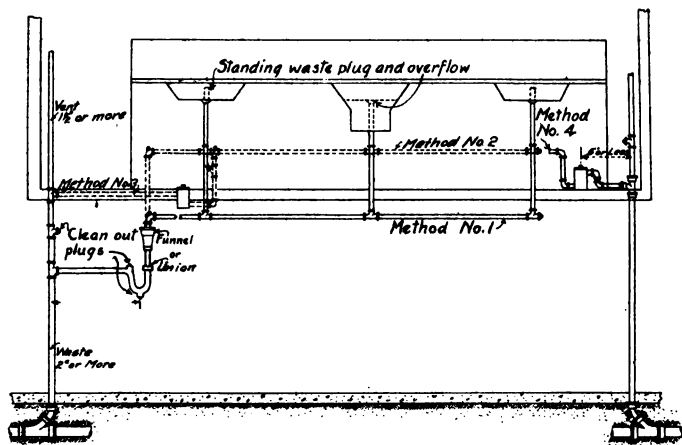
Section 43. Ice House and Storage Drains. The floor drains, in ice house and refrigerator rooms, markets, slaughterhouses, storage rooms for provisions, or any room where ice is stored or used shall be of adequate size, properly trapped, and when

necessary discharge into a catch basin.

Note: It is recommended that the washing compartments be provided with standing waste and overflow pipe, and that a continuing flow of fresh water be maintained while the fountain or bar is in use.

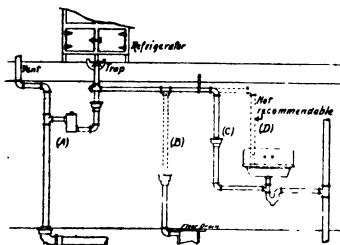
Section 44. Refrigerator Wastes. The waste pipe from a refrigerator, ice box or trap, or any receptacle in which provisions are stored shall not connect directly with any drain,

soil or waste pipes. Such waste pipes shall be so arranged that they may be flushed properly. (For methods of installation see sketch No. 48.)



Sketch No. 47.—Outlining methods of connecting bar, soda fountain, and similar fixtures. Sec. 42.

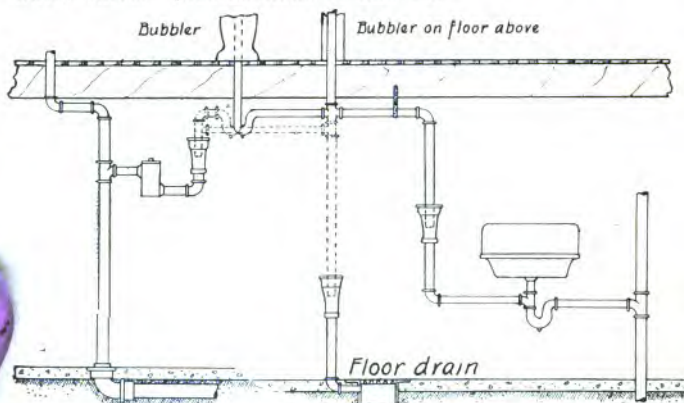
Section 45. Area and Court Drains. When permitted to connect to the sanitary or house drainage system, the various drains from small yards, areas and courts may be connected together and their contents discharged into a yard catch basin, an adequate basement floor drain or a deep seal trap, so located that it is readily accessible for cleaning and is protected from frost. The surface opening of the drain to catch basin must be provided with an adequate strainer, and where necessary with a back flow valve.



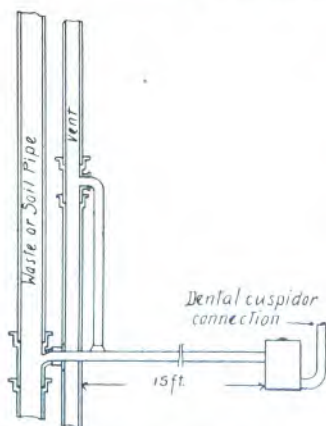
Sketch No. 48.—Illustrating methods of connecting refrigerator wastes. Sec. 44.

Section 46. Elevator Connections. All hydraulic elevators, lifts and motors in order to prevent back pressure in any sewer drain,

soil or waste pipe, shall discharge into a tank of adequate capacity. Such tanks shall be provided with adequate deep seal trap or inverted bends and where necessary with back-water valve. (See sections 10 and 21.)



Sketch No. 49.—Illustrating three approved methods of connecting bubbler wastes. Sec. 47.



Sketch No. 50.—Illustrating a dental cuspidor installation. Sec. 48.

Section 47. Bubbler Waste
How to Drain. Waste pipes from bubblers may discharge into an open fixture, trapped, funnel or floor drain. Such waste pipes, however, must be trapped to preclude their use as a local vent for cellar, etc.

When bubblers are connected directly to soil, waste or drain pipes, they shall be trapped and vented properly. (For methods of installation see sketch No. 49.)

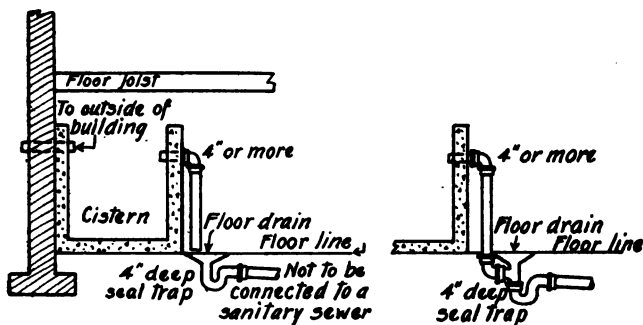
Section 48. Dental Cuspidors. Dental cuspidors when

connected to a waste pipe must be effectively trapped and vented, as shown in sketch No. 50.

The length of the horizontal waste pipe between the vent pipe and trap must not exceed fifteen feet. The total fall of the horizontal waste pipe between trap and vent shall not exceed the inside diameter of said waste pipe.

Section 49. Cistern Overflow. Overflow pipe from cisterns shall not connect directly with any house sewer, but shall discharge into an open fixture, catch basin or floor drain. (See sketch No. 51.)

Note: Overflow pipes from cisterns shall not discharge, however, into sanitary sewers intended for domestic use only.



Sketch No. 51.—Illustrating cistern overflow connections with combination sewer. Sec. 49.

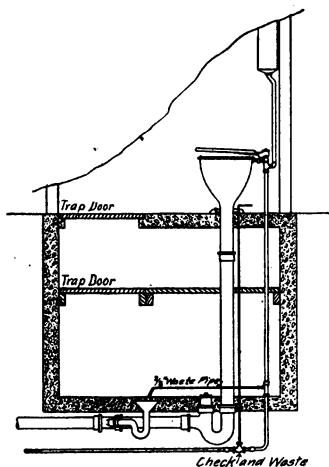
Section 50. Overflow Pipes. The discharge of waste pipes from beer pumps, water motors, overflow pipes from water supply tanks, expansion tanks and drip pans shall be provided for in the same manner as for refrigerator wastes.

FIXTURES

Section 51. (a) Fixtures—Water-Closets. All water-closets shall be made of porcelain or vitreous chinaware. The bowl and trap must be made of the combined pattern in one piece. They shall hold a sufficient quantity of water and be of such shape and form that no fecal matter will collect on the surface of the bowl. All water-closets shall be equipped with adequate flushing rims, so as to flush and scour the bowl properly when discharged.

(b) Frostproof Closets, When Permitted. Frost-proof closets will be permitted in buildings when extreme

conditions necessitate their use. When installed, the bowl must be of vitreous chinaware or cast iron enamel of the flush rim pattern, provided with an adequate tank automatically drained. The soil pipe between the hopper and the cast iron trap shall be of 4-inch cast iron, free from offsets and only of sufficient length to protect the trap against frost; but in no case shall the soil pipe between the trap and hopper bowl be more than 6 feet in length.



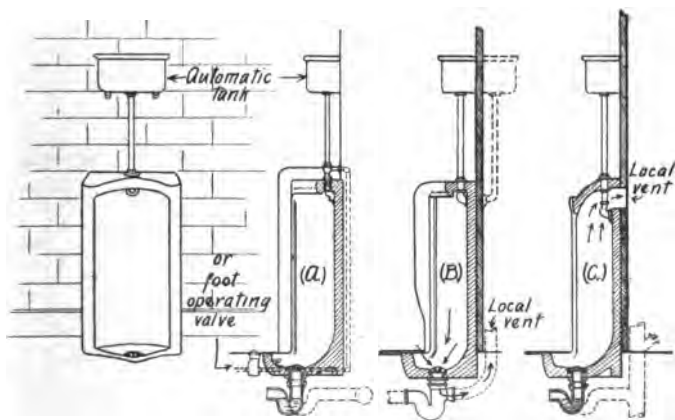
Sketch No. 52.—Showing method of installing frost-proof closets. Sec. 51 (b).

(For method of installing outdoor closets see sketch No. 52).

Note: The installation and use of the above type of fixture is to be discouraged as much as possible. Under the most favorable conditions little can be said for this closet from a practical and sanitary standpoint.

(c) **Open Plumbing.** All plumbing fixtures shall be installed or set free and open from all enclosing work. Where practicable all pipes from fixtures shall be run to the wall.

Section 52. Urinals. Urinals must be made of material impervious to moisture, must be properly flushed and kept in a sanitary condition. If cast iron is used in the construction of urinals it must be enameled on the inside of the trough or bowl and coated with a durable paint or enameled on the outside. No sheet metal will be permitted. (See sketch No 53, also section (order) 5260, page 98).



Sketch No. 53.—Showing modern urinal set into the floor and the floor graded toward the urinal. For methods of installation see cross section A. Cross sections B and C illustrate methods of equipping such urinals with a local vent. Sec. 52.

Section 53. Bath Tubs, Sinks and Laundry Tubs. Bath tubs shall be made of earthenware, vitreous chinaware, enameled iron ware or other impervious material. Sinks and laundry tubs may be made of other materials where conditions make it necessary.

Section 54. (a) Location of Fixtures. All toilet rooms and bathrooms shall have at least one outside window or

be provided with local vent pipes or air shafts so as to insure at least four changes of air per hour. Local vents or air shafts for toilet rooms shall not be connected with the plumbing system, and must be so installed, as to provide adequate ventilation.

(b) **Water Supply to Fixtures.** All water-closets, urinals or other plumbing fixtures shall be provided with a sufficient supply of water for flushing to keep them in a sanitary condition.

(c) **Flush Tanks.** All flush tanks or flushometer valves within any building shall have a flushing capacity of not less than three gallons for water-closets and not less than one gallon for urinals.

REPAIRS AND RECONSTRUCTION

Section 55. Old Materials Re-used. All fixtures, soil, waste and vent pipes removed from an old building, if found to be in good condition, may be used in the same building or may be used in another building, provided the owner of the building in which they are installed gives his written consent.

(b) **Old House Drains.** Old house drains may be used in connection with new buildings or new plumbing only when they are found on examination or test to conform to the requirements of this Code governing new sewers and drains. If the old work is found defective, the local or state inspector shall notify the owner of the changes necessary to make it conform to the requirements of this Code.

(c) **Fixtures Replaced.** When an old or defective fixture is removed, to be replaced by a new one, and no other fixture or piping is to be added or remodeled, it will not be necessary to reconstruct the soil, waste or vent piping to make it conform to this Code, unless the same is in a defective condition. In such cases, if found necessary, the fixtures shall be provided with efficient deep seal traps or deep seal resealing traps of the self-scouring centrifugal type.

(d) **Reconstruction.** When old or defective plumbing is to be remodeled, additional fixtures installed or the whole plumbing system moved to another part of the building, then the remodeled system shall be made to conform reasonably to this Code.

(e) **Repairs.** All repairs to fixtures or piping shall be done in a substantial, sanitary and workmanlike manner.

For sections 56, 57 and 58, relating to private water supply and sewage disposal systems, see pages 134 to 144, inclusive.

INSPECTIONS AND TESTS

Section 59. (a) Local Inspections. All piping of a drainage or plumbing system in cities having local plumbing inspectors (except in case of repairs as specified in subsection m) shall be tested by the plumber in charge in the manner herein provided, in the presence of the local inspector of plumbing or his authorized deputies. For state inspections see pages 16, 24.

(b) **Materials and Labor.** The material and labor for tests shall be furnished by the plumber in charge.

(c) **House Drain Tests.** The entire house drain with all its branches, receptacles and connections shall be brought so far as practicable to the surface or grade of basement floor and tested with water or air. Upon being found free from defects and leaking joints, the test shall be considered satisfactory.

(d) **Stable and Garage Tests.** If a stable, garage or any part thereof is used for human habitation, or is so constructed that it may be used as such, the same tests shall be made as for an ordinary dwelling.

(e) **Rain Leader Tests.** Rain water leaders and their roof connections where they are permitted within the walls of any building, and such branches as connect with the house drain three feet beyond basement wall, shall be tested with water or air.

(f) **Covering of Work.** No part of any plumbing or drainage system shall be covered until it has been inspected, tested and approved. If any part is covered before being tested and approved, it shall be uncovered at the direction of the inspector.

(g) **Final Inspection.** When the plumbing or drainage system is completed and fixtures are installed the final inspection shall be made; and no such plumbing or drainage

system shall be used until it has been inspected and approved, unless special permission is given by the proper authorities for its temporary use.

(h) **Inspection for Changes or Alterations.** When additional fixtures are installed or the style or location of any fixture is changed or, when changes are made in the piping system, the work shall be inspected.

(i) **Soils, Waste and Vent Tests.** Soil, waste and vent pipes, rain water leaders and all work known as "roughing in and underfloor work" between the house drain connections to points above the finished floors and beyond the finished face of walls and partitions shall be tested.

(j) **Water and Air Test.** The water test shall be applied by closing all openings in the pipes with proper testing plugs, to the highest opening above the roof, and completely filling the system with water, or an air test with pressure of at least five pounds shall be used. If the pipes are found free from defects and leaking joints, the test shall be considered complete and satisfactory. Buildings five stories or more in height may be tested in sections as directed by the plumbing inspector:

When water is not available, or when there is danger of freezing, the air test, with a pressure of at least five pounds, shall be used.

(1) **Smoke Test.** The smoke test shall be used in testing the sanitary condition of the drainage or plumbing system of all buildings where there is reason to believe it has become dangerous or defective on account of settlement of the building, abuse, accident or other cause.

The smoke machine shall be connected to any suitable opening or outlet in the system. When the system is filled completely with dense pungent smoke, and the openings emit smoke, they shall be closed (and an air pressure equivalent to a one inch water column may be applied) and left standing at least ten minutes. If there is no leakage or forcing of trap seals, the system shall be considered air and gas tight. Nothing, however, in this section shall be construed to prohibit the removal of any clean-out or the unsealing of a trap

to ascertain if the smoke has reached all parts of the system.

(m) **Tests for Repairs.** Inspections may be made, but tests shall not be required after the repairing or replacing of any old fixture, faucet or valve by a new one to be used for the same purpose, forcing out stoppage, repairing leaks or relieving frozen pipes and fittings. Such repairs or alterations may not be construed to include cases where new vertical or horizontal lines of soil, waste, vent or interior rain water leaders are used or their relative locations changed. In a building condemned by the proper authorities because of insanitary conditions of house drainage or plumbing, tests and inspections shall be made as for new buildings. In such cases repairs or alterations shall be made which are necessary to make the plumbing sanitary.

Note: No test nor inspection shall be required where a house drainage and plumbing system or part thereof is set up for exhibition purposes; nor shall a test be required (although inspection may be made) where the plumbing is placed in an out-house, stable or detached building used exclusively for such purpose.

(n) **Preparations for Inspection.** When work is ready for inspection the plumber in charge, or in case none is employed, the owner, shall make such arrangements as will enable the inspector to reach all parts of the building readily, shall have present the proper apparatus and appliances for making the tests, and shall furnish such assistance as may be necessary in making proper inspection.

(o) **Notice for Inspection.** The plumber in charge, or the owner of the property in case no plumber is employed, shall notify the inspector in person, by telephone or in writing when the work is ready for inspection. If the inspection is not made within a reasonable time after the notice is given, the plumber in charge, or the owner, may proceed with the work.

Section 60. (a) Defects in Materials. If tests or inspection discloses defective material, leakage, or unworkmanlike construction, which does not conform to the requirements of this Code, and which is condemned by the inspector of plumbing, the same shall be removed and replaced within three days, and when necessary retested.

The presence of any foreign substance, other than that provided for in this Code, about a joint or any part of a plumbing or drainage system shall be sufficient cause for condemning such joint or part of the system. Any split fittings, hubs or defective material which do not conform to the requirements of this Code, and which have been condemned by the inspector, shall be removed from the work and not used again.

Note: Poor workmanship, design or methods of installation likewise shall be sufficient cause for the condemnation of the whole or any part of the system.

SANITATION

Section 61. (a) Drainage Installations. All drainage systems and installations, including piping, traps and back venting in connection therewith, must be made in a sanitary manner, and in accordance with good practice and the provisions of this Code.

(b) Workmanship. All work must be executed in a workmanlike manner, in accordance with the provisions of this Code.

(c) Protection Against Trap Siphonage. Every fixture trap shall be protected from siphonage and air circulation insured where necessary by a vent or back vent pipe.

(d) Dead Ends. All dead ends in pipes shall be avoided in the installation of any plumbing system.

(e) Capacity for Flushing. All systems, installations and pipes supplying water for the flushing of closets, urinals or similar fixtures shall be of sufficient capacity and size to provide flushing adequately to keep them in sanitary condition.

(f) Drinking Water. Systems and installations supplying drinking water shall be of durable material and so constructed and installed that pollution or contamination is not reasonably possible.

(g) Contamination from Fixture Connection. The water supply to any fixture shall be so placed as to reasonably preclude the possibility of the contents of such fixtures being siphoned or drained into the water supply pipes.

(h) Insanitary Installations. No fixtures or installations shall be maintained which are insanitary or of improper design.

(i) Catch Basin Cleaning. All sediment collected in catch basins shall be removed at least once a year and oftener when necessary. All sediment, grease or other waste liable to cause a nuisance shall be hauled away or buried.

GENERAL ORDERS
OF THE
INDUSTRIAL COMMISSION
AND
STATE BOARD OF HEALTH
ON
SANITATION, LOCATION, CONSTRUCTION
AND CARE OF TOILET ROOMS FOR
PUBLIC BUILDINGS AND PLACES
OF EMPLOYMENT

These orders, rules and regulations were originally adopted by the Industrial Commission on October 15, 1914, adopted by the State Board of Health as amended on June 27, 1917, and the amendments adopted by the Industrial Commission on June 30, 1917, and published in the official state paper as required by law on July 5, 1917.

Further amendments were adopted by the State Board of Health on June 28, 1921, and by the Industrial Commission on August 13, 1921, and published in the official state paper on August 31, 1921. Under the provisions of Sections 2394—41 to 2394—70, Statutes of 1915, and Section 959—55A—2, Chapter 731, Laws of 1913, these orders and regulations have full force of law and will be administered and enforced by the Industrial Commission and State Board of Health jointly as provided herein.

These orders, rules and regulations of the Industrial Commission and the State Board of Health are identical. (For further particulars relating to building construction, including definitions, supervision, etc., see Building Code issued by the Industrial Commission of Wisconsin; also local regulations where such exist.)

(For plumbing installations see State Plumbing Code issued by the State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering, also local ordinance regulations where such are in force.)

NEW INSTALLATIONS FOR PUBLIC BUILDINGS AND PLACES OF EMPLOYMENT

TOILET ROOM REQUIREMENTS.

For the number of closets and urinals required in buildings of various classes, see Sections or orders 5532, 5618, 5722, 2203. (Note. "Section" refers to Plumbing Code, "order" to Building Code.)

For detailed requirements regarding fixtures, piping, etc., see State Plumbing Code, issued by the State Board of Health. "Approval by an authorized agent" means:

1. By a deputy of the Industrial Commission or plumbing inspector of the State Board of Health; or
2. By the city building department or city health department where such department acting under the provisions of a city ordinance issues an order or a permit for the work in question; or
3. By the city plumbing inspector in cases not covered by 2.

Section (Order) 5250. Toilet Rooms Required. Every place of employment and every public building hereafter constructed (including all buildings covered by the State Building Code), shall have adequate toilet rooms, completely enclosed, and so arranged as to insure privacy; except that where no dust prevails in foundries, rolling mills, blast furnaces, tanneries and such other similar buildings as are specified by the Industrial Commission, partitions enclosing toilets shall be at least 7 feet high but need not be carried to the ceiling nor enclosed at the top, provided such ceiling is at least 15 feet high, and provided such toilets are located in rooms which females are not allowed to enter.

Note: The above exemption will be permitted even though the ceiling is lower than 15 feet, if local ventilation through the closet bowl is provided in a manner approved by the Industrial Commission or State Board of Health.

Toilet rooms should, if possible, be placed on each occupied floor, especially in factories. Much time may thus be saved.

Section (Order) 5251. Toilet Rooms for the Two Sexes. Where the two sexes are accommodated, separate toilet rooms shall be provided, except

- (1) In apartment houses;
- (2) If approved in writing by the Industrial Commission or the State Board of Health, or their authorized agents, in

buildings accommodating not more than five persons of both sexes, provided the door of such toilet room is kept locked and the key is kept in a place accessible to all such persons. But whenever the number of such persons shall exceed five, separate toilet rooms shall be provided.

Entrances to toilet rooms for the two sexes shall be properly separated, by screens or otherwise, and shall wherever possible be at least twenty feet apart.

Section (Order) 5252. Sex Designated. Wherever women are employed or accommodated, each toilet room shall be distinctly marked with regard to the sex which uses it, and no person shall be allowed to use a toilet room assigned to the other sex, except as provided in Section (Order) 5251.

Section (Order) 5253. Location, Light, Ventilation. Every toilet or bathroom shall be so located as to open to the outside light and air by windows or skylight openings directly upon a street, alley, court, or vent shaft, except as hereinafter provided. Every such vent shaft shall have a horizontal area of at least one square foot for each water-closet or urinal adjacent thereto, but the least dimension of such shaft, if one story high, shall not be less than three feet; if two stories high, not less than four feet; and one foot additional for each additional story.

The glass area for a toilet room containing one closet or urinal shall be at least 4 square feet, with 2 square feet additional for each additional closet or urinal.

In addition to the windows herein required, each toilet room which contains more than three fixtures (closets and urinals) shall have a vent flue of incombustible material, vertical or nearly so, running through the roof, with cap or hood of the siphon type, or its equivalent, and the vent shall be not less than the following sizes:

Four fixtures	8-inch pipe
Five or six fixtures	10-inch pipe
Seven to ten fixtures	12-inch pipe

But if the windows or skylights can not be opened, then vent pipes shall be provided as specified in order 5254.

No toilet room shall have a movable window or ventilator opening on any elevator shaft or any court which contains windows of sleeping or living rooms above; except that a toilet room containing not more than two closets may have a movable window on such court, provided such room has a vent flue running above the roof.

Section (Order) 5254. Location Without Outside Windows—When Permitted. If a location with outside windows is impracticable, a different location will be permitted, as follows:

(1) For a toilet used by not more than three persons, without special permit.

(2) For a toilet in a new building, used by more than three persons, only with the written approval of the Industrial Commission or State Board of Health, or their authorized agents.

(3) For a new toilet in an existing building, used by more than three persons, only with the written approval of the Industrial Commission or State Board of Health or their authorized agents.

Such approval shall be granted only where a location with outside windows is not reasonably possible.

Where a toilet room without outside windows is permitted it shall have a fixed window or windows to an adjoining room, with glass area as provided above, arranged so as to furnish as much light as possible. Frosted or other translucent glass shall be used when necessary for privacy. In no case shall the floor be of wood. A vent flue of incombustible material shall be provided, vertical or nearly so, running through the roof, with a cap or hood of the siphon type or its equivalent, and the vent shall be not less than the following sizes:

One fixture (closet or urinal)	6-inch pipe
Two fixtures	8-inch pipe
Three fixtures	10-inch pipe
Four or five fixtures	12-inch pipe
Six or seven fixtures	14-inch pipe
Eight to ten fixtures	16-inch pipe

Notes: (1) Glass area 50 per cent greater than required is recommended.

(2) An air inlet is recommended if it can be made sound proof.

(3) A fan in the flue will be required if necessary for proper ventilation. If there is no fan a steam coil, or even an electric light at the bottom of the flue, will help to produce circulation. Where a metal vent pipe extends above the roof, a double pipe or other insulation against cold, is recommended.

(4) Closets provided with a local vent are recommended and may be required in some cases before approval is granted.

Section (Order) 5255. Artificial Light. Every toilet room (except in a private apartment) shall be artificially lighted during the entire period that the building is occupied, wherever and whenever adequate natural light is not available, so that all parts of the room are easily visible.

Section (Order) 5256. Size. Every toilet room shall have at least 10 square feet of floor area, and at least 100 cubic feet of air space, for each water-closet and each urinal.

Section (Order) 5257. Floor. The floor and base of every toilet room shall be constructed of material (other than wood)

which does not readily absorb moisture and which can be easily cleaned; except that wood floors may be used

(1) In private apartments;

(2) If approved in writing by the Industrial Commission or the State Board of Health or their authorized agents, in existing buildings where there is an existing wood floor in good condition and where such toilet will be used by not more than five persons; provided further that such room must have an outside window or skylight.

Note: To make a concrete floor nonabsorbent, the concrete must be a dense rich mix, finished smooth, and should be kept painted.

Section (Order) 5258. Walls and Ceilings. The walls and ceilings of every toilet room shall be completely covered with smooth cement or gypsum plaster, glazed brick or tile, galvanized or enameled metal, or other smooth, non-absorbent material. Wood may be used if well covered with two coats of body paint and one coat of enamel paint or spar varnish. But wood shall not be used for partitions between toilet rooms, nor for partitions which separate a toilet room from any room used by the opposite sex. All such partitions shall be as nearly sound-proof as possible.

Note: Walls and partitions should be of light color to increase illumination and facilitate cleaning.

In large rooms a hose connection and a floor drain should be provided.

Section (Order) 5259. Partitions Between Fixtures. Adjoining water-closets shall be separated by partitions. Each individual urinal or urinal trough shall be provided with a partition at each end and at the back, to give privacy.

Where individual urinals are arranged in batteries, a partition shall be placed at each end and at the back of the battery. A space of 6 to 12 inches shall be left between the floor and the bottom of each partition. The top of the partition shall be from 5½ feet to 6 feet above the floor. Doors with the top 5½ feet above the floor and the bottom 6 to 12 inches above the floor shall be provided for all water-closet compartments.

Water-closet compartments shall be not less than 30 inches in width, and shall be sufficiently deep to permit the door to swing past the fixture when opened. Doors must swing inward.

Recommendations: It is recommended that doors be equipped with a spring or other device so that they will remain open when the compartment is vacant, and will need to be latched to hold shut when compartment is occupied.

Note: Wood is not recommended for compartment enclosures; if used, it should be hardwood.

Section (Order) 5260. Fixtures. Only individual water-closets of porcelain or vitreous chinaware shall be used. (See State Plumbing Code, sections 51-54, for further details, also for type of frostproof closets permitted.) Water-closet seats shall be of wood or other non-heat-absorbing material, and shall be finished with varnish or other substance so as to be impervious to water.

Urinals shall be made of material impervious to moisture, and of such design, materials and construction that they may be properly flushed and kept in a sanitary condition.

In all new installations in schools, theatres, hotels, office buildings, mercantile buildings, libraries and museums, or similar public buildings, only individual urinals shall be used. Such individual urinals shall be of porcelain or vitreous china, set into the floor, the floor graded toward the urinal, and shall be equipped with an effective automatic tank or valve or satisfactory foot-operating flushing device.

This order shall be enforced on all new urinal installations after July 1, 1922.

Section (Order) 5261. Protection from Frost. All water-closets and urinals and the pipes connecting therewith shall be properly protected against frost, either by a suitable insulating covering, or by providing and operating a suitable heating apparatus, or in some other approved manner; so that such water-closets and urinals will be in proper condition for use at all times.

Note: Toilets should be adequately heated in cold weather. Heating equipment should be arranged to permit cleaning of floors and walls.

Section (Order) 5262. Where No Sewer System Is Available. Each water-closet and urinal and each lavatory or slop sink located in a toilet room, shall be connected with a sewer system, where a sewer system is available. In locations where a sewer system is not available, or cannot be made available, the disposal of human waste may be accomplished as follows:

- (1) Sewage treatment tank and disposal system.

- (2) Where the local conditions make it impractical to install such system, outdoor toilets (see Section [Order] 5263) or other facilities permitted by the State Board of Health may be used; provided that in the case of places of employment for more than ten persons, schools larger than one room, and apartment or tenement houses, water-flush toilets as herein described shall be provided, unless outdoor toilets or other facilities are permitted in writing by the Industrial Commission or State Board of Health.

Note: For detailed requirements for such systems, see State Plumbing Code.

Section (Order) 5263. Outdoor Toilets. Outdoor toilets shall comply with Sections (Orders) 5250 to 5259, inclusive, and in addition shall be

(1) Located on ground that is well drained, and where there is no possibility of contaminating any drinking water supply.

(2) Provided with suitable approach, such as concrete, gravel or cinder walk.

Note: For schools a concrete walk is recommended.

(3) The foundations shall be of concrete or other masonry.

(4) The vault shall extend at least 6 inches above ground, be as dark as possible, and be proof against entrance by flies, rats or other vermin. The upper portion shall be of concrete or of brick or stone laid in cement mortar. If in damp ground, the entire vault shall be of concrete or of brick or stone laid in cement mortar.

(5) All windows, ventilators and other openings shall be screened to prevent the entrance of flies, and all doors shall be self-closing. A separate ventilator shall be provided for the vault and shall extend above the roof and be provided with an effective ventilating hood.

(6) The entire installation must be kept clean and sanitary. Milk of lime (freshly slaked lime) or other equally effective disinfectant must be used in the vault and in the urinal trough in sufficient quantities and at frequent intervals. The floors, seats and urinals must be scrubbed as often as necessary. The vault must be cleaned out at proper intervals.

Note: Experience has proven that some person should be assigned and required to give frequent and regular attention to the toilets in order to keep them clean and sanitary.

Section (Order) 5264. All Toilets—Cleanliness. Every toilet room and every part thereof, including walls, floors and ceiling and all fixtures therein, must be kept clean, efficient, and in good repair. In each toilet room sufficient toilet paper must be provided, and it must be made of material which will not obstruct the fixtures in such toilet room.

Recommendation on Service Closet. Where practicable a service closet conforming with requirements for construction of toilet rooms shall be provided and supplied with cleaning tools, soap, toilet paper and toweling necessary for sanitary upkeep of toilet rooms.

Section (Order) 5265. Indecent Pictures. Indecent or suggestive marks, pictures, or words are forbidden in toilet rooms, and such defacement when found must be at once removed.

Section (Order) 5532. Theatres and Assembly Halls. Separate toilet rooms in connection with the auditorium shall be

provided for males and females. One closet shall be installed for each 200 females or fraction, and one closet and one urinal for each 300 males or fraction, assuming the audience to be equally divided between males and females; except that in dance halls there shall be provided one water-closet for each 100 females or fraction, one urinal for each 150 males or fraction, and one water-closet for each 300 males or fraction.

There shall be separate water-closets provided for males and females in connection with the stage in every theater which accommodates more than 500 persons, except theaters used for motion picture exhibitions only.

Separate drinking fountains shall be provided for the stage and auditorium, wherever water supply is available. One washbowl shall be provided for every two closets or urinals or fraction. (See Sections [Orders] 5250 to 5265, inclusive.)

Section (Order) 5618. Schools. School buildings shall have the following sanitary equipment:

One water-closet for every 20 females or fraction, except for grammar and primary grades, where there shall be one water-closet for every 15 females or fraction.

One water-closet and one urinal for every 40 males or fraction, except for grammar and primary grades, where there shall be one water-closet and one urinal for every 30 males or fraction. Toilet accommodations for males and females shall be placed in separate rooms with doors not less than 20 feet apart. A drinking fountain and sink shall be installed in each story and basement, for each 6,000 square feet of floor area, or fraction. A proper number of washbowls shall be provided. Drinking fountains shall not be installed in toilet rooms.

Note: Ordinarily there should be at least one wash bowl for every two closets and urinals. Washbowls should be placed either in the toilet room or immediately outside.

Where privy vaults are permitted, the building containing the same shall be placed at least 20 feet from any other occupied building.

Section (Order) 5722. Apartment Houses, Hotels,* Lodging Houses, Outhouses, Dormitories, Hospitals, Asylums, and Places of Detention. Every apartment shall have a water-closet in a bathroom or separate compartment.

All other buildings of this classification shall have at least one water-closet for every fifteen rooms or fraction thereof.

Note: Rooms with private water-closets shall not be considered in counting either the number of rooms or the number of water-closets.

* For Hotels see also Hotel Regulations adopted by the State Board of Health.

In every building of this classification where city water supply is available or can be made available, there shall be at least one proper sink or washbowl with running water. In apartment houses there shall be such a sink or washbowl in each apartment.

General Note. Approval of Plans. Under Chapter 133 of the Laws of 1917, plans and specifications in duplicate for theaters, schoolhouses, and hotels, also for material alterations of existing buildings, must be submitted to the Industrial Commission for approval. If plans for any building are approved by the Industrial Commission, or by the city building inspector, plumbing inspector, or health department, the architect or builder shall keep at the building either the plans which were approved or a copy thereof, and shall mark on such plans, in ink, the person or department which gave the approval, and the date thereof.

Under Chapter 133, Laws of 1917, these General Orders apply alike to the architect, builder, and owner, and are enforceable under a forfeiture fixed by the law at not less than ten dollars nor more than one hundred dollars for each offense.

NEW AND EXISTING INSTALLATIONS

For Places of Employment

TOILET ROOM REQUIREMENTS.

Note: "Section" refers to Plumbing Code; "Order" to Building Code.

Section (Order) 2200. Toilet Rooms Required. Every place of employment, whether heretofore or hereafter constructed, shall have adequate toilet rooms, completely enclosed, and so arranged as to insure privacy; except that in foundries, rolling mills, blast furnaces, tanneries, and such other similar buildings as are specified by the Industrial Commission, partitions enclosing toilets shall be at least seven feet high but need not be carried to the ceiling nor enclosed at the top, provided such ceiling is at least 15 feet high, and provided such toilets are located in rooms which females are not allowed to enter.

Note: The above exception will be permitted even though the ceiling is lower than 15 feet, if local ventilation through the closet bowl is provided in a manner approved by the Industrial Commission or State Board of Health.

Toilet rooms should, if possible, be placed on each occupied floor, especially in factories. Much time may thus be saved.

Section (Order) 2201. Toilet Rooms for the Two Sexes. Where the two sexes are accommodated, separate toilet rooms shall be provided, except (if approved in writing by the proper authorities) in buildings accommodating not more than five persons of both sexes, provided the door of such toilet room is kept locked and the key is kept in a place accessible to all such persons. But whenever the number of such persons shall exceed five, separate toilet rooms shall be provided. Entrances to toilet rooms for the two sexes shall be properly separated, by screens or otherwise, and shall whenever possible be at least twenty feet apart.

Section (Order) 2202. Sex Designated. Wherever women are employed, each toilet room shall be distinctly marked with regard to the sex which uses it, and no person shall be allowed to use a toilet room assigned to the other sex, except as provided in Section (Order) 2201.

Section (Order) 2203. Number of Closets and Urinals. In every place of employment, whether heretofore or hereafter constructed, one water-closet shall be provided for every 20 persons, or fraction thereof, of either sex.

In addition thereto, where more than 10 males are employed, one urinal shall be provided for every 40 males, or fraction. Where not more than 10 males are employed, either a urinal shall be provided or the water-closet shall have a projecting lip and self-rising seat. Where trough urinals are used, each two feet of trough shall constitute one urinal.

For number of lavatories see Section (Order) 2212.

Section (Order) 2204. Cleanliness. Every toilet room and every part thereof, including walls, floors and ceiling, and all fixtures therein, must be kept clean, efficient and in good repair. In each toilet room sufficient toilet paper must be provided, and it must be made of material which will not obstruct the fixtures in such toilet room.

Section (Order) 2205. Indecent Pictures. Indecent or suggestive marks, pictures, or words are forbidden in toilet rooms, and such defacement when found must be at once removed.

Section (Order) 2206. Existing Toilet Rooms—Walls. In toilet rooms at present installed, the walls must not be covered with paper. If the walls and ceiling are constructed of wood, they must be covered with a nonabsorbent paint.

Section (Order) 2207. Existing Toilet Rooms—Ventilation. Every toilet room heretofore installed, which is not adequately ventilated by outside windows or skylight, shall be provided with a vent flue of size specified in Section (Order) 5254, in which a fan shall be placed, if necessary for proper ventilation.

Every such toilet room which cannot be kept sanitary shall be moved so as to be open to outside light and air.

Section (Order) 2208. Artificial Light. Every toilet room shall be artificially lighted during the entire period that the building is occupied, wherever and whenever adequate natural light is not available, so that all parts of the room are easily visible.

Section (Order) 2209. Water-Closets at Present Installed. Each water-closet at present installed must be provided with a flushing appliance, which will be as effective in its operation as the type of closet requires.

Each water-closet must be kept clean and in good repair, and obstructions must be removed at once.

Note: Pan, plunger and offset types of water-closet at present installed, will be condemned when found in foul condition or without adequate flush. Long hopper and range closets at present installed will be condemned when the interior surface becomes so rusted and corroded that it cannot be kept sanitary. No such fixtures shall be replaced except with the approved type specified for new installations.

Section (Order) 2210. Partitions Between Fixtures. Adjoining water-closets or seats of range closets must be separated by partitions not less than 5 feet in height. Each in-

dividual urinal or urinal trough must be provided with a partition at each end and at the back to give privacy. Where individual urinals are arranged in batteries, a partition must be placed at each end and at the back of the battery. For new installations see Section (Order) 5259.

Section (Order) 2211. Existing Outdoor Toilets. Existing outdoor toilets will be permitted, until public water and sewer systems are available, if they comply with Sections (Orders) 2200 to 2210, inclusive, and in addition are:

(1) Completely enclosed and separate from any other building.

(2) Advantageously located from the standpoint of convenience, privacy, and sanitation.

(3) Located on ground that is well drained, and where there is no possibility of contaminating a drinking water supply.

(4) Provided with suitable approach, such as concrete, gravel or cinder walk.

(5) The vault must be made tight above the ground so that flies, rats and other vermin cannot get into it.

(6) All windows, ventilators, and other openings must be screened to exclude flies, and all doors must be self-closing.

(7) When the vault is filled to the level of the ground, it must be cleaned out. If a new vault is constructed it must be made in accordance with the requirements for new installations, and the old vault must be properly cleaned, limed and filled with fresh earth.

(8) The entire installation must be kept clean and sanitary. Milk of lime (freshly slaked lime) or other equally effective disinfectant must be used in the vault and in the urinal trough in sufficient quantities and at frequent intervals. The floors, seats, and urinals must be scrubbed as often as necessary.

Note: Experience has proven that some person should be assigned and required to give frequent and regular attention to the toilets in order to keep them clean and sanitary.

Section (Order) 2212. When Water and Sewer Become Available. Within one year after water and sewer systems become available, water-closets, urinals, and lavatories shall be provided.

LAVATORIES

Section (Order) 2213. Adequate washing facilities shall be provided in or near every toilet room. In new installations there shall be at least one lavatory for every five fixtures (closets and urinals), or fraction.

Note: One lavatory for every two or three fixtures is recommended.

Section (Order) 2214. Adequate washing facilities shall be provided (1) in all industries where lead, arsenic, or other poisonous or injurious materials are handled by the employes, (2) in industries where food is prepared or manufactured, and (3) in glue factories, foundries, machine shops and other industries where the employes' hands become dirty or greasy, except that in industries of the last mentioned class, located in small towns, where the employes go home at noon, this requirement may be waived by the Industrial Commission. In new installations there shall be at least one lavatory for every ten employes, or fraction, and hot water shall be provided. Basins or troughs for common use are prohibited.

Notes: (1) Washing facilities where the employe must necessarily wash in running water are recommended. A large trough without stopper, where each person washes in running water from an individual faucet, is generally better than separate bowls.

(2) One lavatory or faucet for every five employes is recommended.

(3) Adequate washing facilities are recommended for all industries.

(4) Washrooms should be constructed according to the requirements for toilet rooms, as far as possible.

Section (Order) 2215. All lavatories must be made of porcelain, enameled iron, or other impervious material.

TOWELS

Section (Order) 2216. In all places of employment the use of towels in common is prohibited. Where lavatories are required, individual cloth towels or paper towels shall be furnished by the employer.

DRINKING WATER

Section (Order) 2217. Each place of employment must be supplied with sufficient pure drinking water, and the faucets or outlets for same must be placed convenient to the employes. Common drinking cups are prohibited. Sanitary drinking fountains must be installed or individual cups must be provided by the employer.

Order 442. Use and Maintenance of Shaftways and Pits. No elevator machine or other machinery shall be located in the pit, except sheaves necessary for the operation of the elevator. Elevator shaftways and pits shall be kept clean, and shall not be used for the storage of any material or the running of any rope, wire or pipe, except such as is needed for the operation of the elevator, and except branch pipes with sprinkler heads; but in old installations, pipes in the shaftway may remain unless carrying steam with pressure exceeding 15 pounds, and wires may remain if placed in conduit. Elevator shaftways and pits shall not be used as passageways.

DON'TS FOR PLUMBERS

- Don't make a flat bend.
- Don't say the plugs won't hold.
- Don't cover work before inspected.
- Don't forget to drift kinked pipes.
- Don't install inefficient clean-outs.
- Don't try to repair a cracked fitting.
- Don't omit clean-outs where required by Code.
- Don't look for gas leaks with an open flame.
- Don't place vent tees lower than the fixtures.
- Don't construct work of under-weight materials.
- Don't call for inspection until work is ready.
- Don't use a "stop and waste" on a hot water pipe.
- Don't give pipes less pitch than the Code requires.
- Don't fail to comply with the requirements of this Code.
- Don't forget to ream out burrs from wrought iron pipes.
- Don't forget to make the overflow on the bath-tub tight.
- Don't try to calk a joint with a round-edged calking iron.
- Don't trim your wiped joints with a knife or cold chisel.
- Don't forget to put in all water pipes so they will drain.
- Don't give wrong house number when calling for inspection.
- Don't fail to put up grounds for pipe and fixture supports.
- Don't let the marks of the bending spring show on the bend.
- Don't let your solder run through to the inside of the pipe.
- Don't let the pipe protrude on the inside of a branch joint.
- Don't use prohibitive fittings in drain, soil and waste pipes.
- Don't neglect to cut clean, sharp threads and to make the joint in every respect in accordance with recognized standards.
- Don't put more fixtures on a line of pipe than the Code allows.
- Don't forget that your license expires on the 31st of December.
- Don't run vent lines less than four inches in diameter through roof.

- Don't fail to support properly lead work piping for its full length.
- Don't refuse to show your plumber's license when such request is made.
- Don't be indifferent about alignment in vertical and horizontal piping.
- Don't wait until after the inspector arrives to fill pipes for testing.
- Don't refuse to comply with local ordinances consistent with this Code.
- Don't construct vent pipes in such manner that they may serve as waste pipes, except where permitted by this Code or local ordinance.
- Don't depend on the supply and waste pipe to hold up a sink or wash basin.
- Don't forget that traps must be set true with respect to their water level.
- Don't think the inspector will ignore the Code because you may have done so.
- Don't construct joints of material or workmanship not permitted by this Code.
- Don't fail to put substantial supports where needed on drain, soil and vent pipes.
- Don't be indifferent about setting of closet bowls or similar fixtures.
- Don't forget to clean up your work and the premises when your job is completed.
- Don't forget when you have completed your work to inspect it yourself and thus avoid trouble.
- Don't install a drainage system in such manner that it will contaminate a drinking water supply.
- Don't forget when repairing that a deep seal trap may be used if venting of the trap is impracticable.
- Don't accept material for stock or job unless it conforms with the requirements of State Code or local ordinance.
- Don't terminate soil, waste, vent and conductor pipes below windows, except when provided for in the Code.
- Don't fail when giving estimates for plumbing to your customers to acquaint them with defects that may exist in

- the old plumbing and drainage on the premises, for in so doing you may save yourself as well as your customer much future trouble.
- Don't install public toilet rooms contrary to the requirements found in this Code.
- Don't be indifferent to the requirements prescribed in the performance of public comfort station or rest room work

INFORMATION FOR THE PUBLIC

Sanitary plumbing promotes health and comfort by removing body and domestic wastes from the neighborhood, furnishing opportunity for the liberal use of pure water for all purposes, and making the air of homes and other occupied buildings free from vitiating influences.

The use of cheap materials and unskilled artisans in the installation of plumbing is false economy. The best is none too good when safety and public health are involved.

The principal condition causing or leading to sickness, undermining our systems and making us more susceptible to disease, consist of pollution of the air from open drains, leakage in pipes, or other constructional defects; inadequate removal of organic wastes; wrong location of fixtures in relation to air and light, and general indifference as to design, construction and care of plumbing and drainage systems.

Control over plumbing by municipalities covers a period of 35 years. In Wisconsin state control was initiated in 1913, by the enactment of the State Plumbing Law and the subsequent adoption and enforcement of the State Plumbing Code, thus standardizing materials and methods of installation throughout the state. Licensing of plumbers is obligatory in all cities above 3,000 population. Local plumbing inspectors are required under the law in all cities of the first, second and third class (population 10,000 or more), and cities of the fourth class (population less than 10,000), may appoint an inspector of plumbing. The State Plumbing Code is applicable to any building in this state. Cities may by ordinance make additional regulations not inconsistent with the law or state code.

In some of the smaller municipalities the position of plumbing inspector is easily combined with that of city engineer, waterworks superintendent, or similar employment, with no sacrifice of economy or efficiency.

If you contemplate the installation of new plumbing and drainage or the remodeling or renovating of an old plumbing system, you will insure sanitary and reasonably durable plumbing if you require that the work be done in accordance with the provisions of the State Plumbing Code and such additional local ordinance requirements as are consistent with this Code. The contract or agreement with your plumber should contain such provision.

When selecting plumbing fixtures for home, office, or factory, make sure that they are of sanitary design and free from defects.

The object of ventilation in a system of drainage or plumbing is to keep the air within the pipe in circulation and thus remove foul air caused by decomposition of solids; to prevent unequal air pressure within the system which may force trap seals or retard the flow of waste water; to prevent the pernicious effects of sewer gas on lead and iron pipes; and to protect the traps against siphonage.

Cast iron soil pipe with durable lead branches, bends, joints and connections properly installed, supported and protected will render the most satisfactory service for ordinary residences or small buildings. For other buildings the plumbing and drainage should be designed to conform with the constructional features of the building and the purpose for which it is to be used.

Use cast iron pipe for all underground house drains within buildings. It will cost slightly more to install but is safer from a sanitation standpoint and less liable to cause trouble by clogging due to settling or breakage.

Stoppage in sewers between the main in street and the building is due generally to one or more of the following causes, which in most cases is easily preventable: Insufficient fall, defective joints and connections, changes in direction improperly made, inadequate flushing, tree roots, grease and improper usage. Stoppages in the drainage system within the building are often caused by poorly made joints, improper connections, change of direction, insufficient flushing, grease, matches, hair pins and other indifferent usage.

When used materials or fixtures are removed they should be examined to determine if they can be of any further use.

The cheapest method of installing plumbing and sewerage is not always the most economical in the end.

Do not locate privy vaults or cesspools closer to the water supply than necessary. Whenever there is danger of polluting the drinking water, the privy vault or cesspool should be made of water-tight masonry. Do not use old or unused wells as cesspools.

Well water should always be regarded with suspicion when improperly located and constructed cesspools, outside vaults or sewage disposal systems are permitted, as there is constant danger that the pollution may reach the well.

House sewers or drains passing in close proximity to a spring or shallow well should be made of cast iron pipe installed as required for work within the building.

Do not leave repairs in your plumbing to the so-called "handy man;" he may do untold damage in a few moments.

When ordering plumber for repairs state the nature of the work to be done, and thus reduce the cost by fore-stalling a trip back to the shop for the necessary tools or materials.

In spite of all the safeguards provided by the state and by cities, all plumbers do not show the same degree of efficiency in workmanship.

In order to keep plumbing and drainage in an efficient, sanitary condition, it is essential that toilet rooms, bath-rooms, sinks, traps, floor drains, ice boxes and other appliances, including floors and walls, receive regular attention. In connection with this do not forget the overflow pipes of lavatories which rapidly become filthy.

Cleaning substances that contain grit or acid in any form should not be used on bathtubs, basins, sinks or other similar fixtures; they injure and sometimes destroy the glazed finish, leaving it subject to absorption and discoloration.

When the glazed finish of enamel and earthenware plumbing fixtures has not been injured, satisfactory results in cleaning can be obtained by the use of a cloth saturated with kerosene oil or soap and water.

The interior of water-closets and urinals, unless frequently cleaned, becomes incrustated. Such deposits may be removed by applying with a swab a solution of water and muriatic acid.

To avoid trouble don't use your water-closet, lavatory or sink for garbage.

Don't put burned matches or other foreign substances in your wash bowls, sinks, or similar fixtures.

Don't stop leaks in your plumbing system with putty or other inadequate substances.

If the plumbing in your home is properly installed and given reasonable care it will **not become** insanitary nor dangerous to health.

Your house, office or factory should be reasonably free from dampness, should have an abundant supply of pure fresh air, sunshine and pure water, and should be equipped with sanitary plumbing.

A sleeping room is not the proper place for the location of wash bowls, unless they are properly installed and kept clean and sanitary.

Sewer air is not fresh air and under certain conditions, may be actually injurious to health, and it can never be accepted as safe air to breathe.

Sewer air and stench emanating from terminal endings or other defective plumbing are unnecessary and objectionable.

Leaks in a plumbing system which admit sewer air to your living rooms may be discovered by applying in proper manner the smoke or peppermint test, or both, in accordance with section 59.

Privy vaults, defective drains and the discharge terminals of drainage systems assist flies, rats and other vermin in spreading typhoid fever and other contagious diseases.

When the use of disinfectants is required, consult your local health officer.

CARE OF PUBLIC TOILET ROOMS

It is important that public toilet rooms be properly located, adequately designed, provided with plenty of light and air, and kept in good repair, clean and sanitary.

It is also important that tank pulls, seats, walls, door knobs, and floors be frequently and thoroughly cleaned and kept clean.

Materials of wood, and materials otherwise unprotected should be kept well painted.

SUGGESTIONS TO LOCAL INSPECTORS

When in doubt consult the State Plumbing Code.

Make it a part of your duty to become thoroughly acquainted with the provisions of this Code and render your decisions consistently in accordance therewith.

Your local Code, if you have one, may have additional rules and regulations, which, however, must be consistent with the State Code.

The State Board of Health will assist you in determining the intent of the State Code where it may not seem clear to you.

The State Board of Health has ruled that its decisions, upon due investigation and findings, shall be final.

Know the reasons for every rule. "The rules say so" is not a sufficient interpretation of a given regulation. All rules are based on facts and sound reasoning.

The qualifications of a plumbing inspector include a thorough knowledge of the theory and practice of plumbing; ability to interpret plans; a good knowledge of laws, rules and regulations governing installations; ability to advise with citizens and impart educational information relating to his work; an agreeable appearance, ease of approach, fairness and impartiality.

His duties are:

1. To enforce the local and state plumbing regulations.
2. To insure durable materials, elimination of unsafe materials, and the proper design, location, light, ventilation, air and workmanship.
3. To supervise and assist impartially in the licensing of plumbers.
4. To make a comprehensive study of what constitutes safe, efficient and economical plumbing, water supply and drainage installations.

5. To keep his office records so they can be readily understood by others who have to consult them. A report to the State Board of Health of his year's work is required in January of each year and at such other times as the board may deem it necessary. Blanks are forwarded for such report.

The success of inspection work and its ultimate usefulness to the citizen of the state depend upon the following factors:

1. Rendering the right kind of service at the right time.
2. Avoiding prosecution except in extreme cases, such as repeated violations and failure to comply with reasonable orders issued.
3. Conduct that will make for continued co-operation of the general public and co-workers.
4. Avoiding meddlesomeness and over-inspection.
5. Applying the rules of reason, good judgment, and fairness.

6. Dissemination of constructive information by personal interview, the press and other educational mediums.

The inspector should be as much an educator as an inspector.

Do not lose sight of the fact that the principal reason for plumbing inspection is to require that plumbing be properly installed, free from defects, and sanitary. Your duties do not end with the plumber ; safe-guarding the public should always be your aim.

For violations of the State Code, the state law or local ordinances, consult your city attorney for advice. Violations of the State Code and licensing features of the law which you cannot adjust satisfactorily should be reported to the State Board of Health in writing.

You should at all times be ready to give information and assistance so that the provisions of this Code can be administered to the best interest of all concerned.

TABLES, RULES AND CALCULATIONS

On the following pages are presented some of the tables and calculations found useful by plumbers, mechanical engineers, architects and others in solving common problems encountered in plumbing and drainage installations.

COMMERCIAL WEIGHT

16 drams	= 1 ounce
16 ounces	= 1 pound
2000 pounds	= 1 ton

SQUARE MEASURE

144	square inches	= 1 square foot
9	square feet	= 1 square yard
30 $\frac{1}{4}$	square yards	= 1 square rod
272 $\frac{1}{4}$	square feet	= 1 square rod
160	square rods	= 1 acre
640	acres	= 1 square mile

CUBIC MEASURE

1728	cubic inches	= 1 cubic foot
28	cubic feet	= 1 cubic yard
231	cubic inches	= 1 gallon
2150.4	cubic inches	= 1 bushel

LONG MEASURE

12	inches	= 1 foot
3	feet	= 1 yard
16 $\frac{1}{2}$	feet	= 1 rod
320	rods	= 1 mile

LIQUID MEASURE

4	gills	= 1 pint
2	pints	= 1 quart
4	quarts	= 1 gallon
231	cubic inches	= 1 gallon
31 $\frac{1}{2}$	gallons	= 1 U. S. barrel (oil barrel approx. 51 gals.)

MEASUREMENT OF WATER

A gallon of water contains 231 cu. in. and weighs 8.33 lbs. (approximately $8\frac{1}{2}$ lbs.)

A cubic foot of water contains 1,728 cu. in., weighs at its maximum density 62.425 lbs. (approximately $62\frac{1}{2}$ lbs.), and is equal to 7.480 gallons (approximately $7\frac{1}{2}$ gals).

CIRCUMFERENCE—(Also see Table 5)

To find the circumference of a circle, multiply the diameter by 3.1416 (approx. 3 1-7.)

Example: If the diameter of a circle is 10 inches, the circumference will be 3.1416 times greater:

$$\begin{array}{r} 3.1416 \\ 10 \\ \hline \end{array}$$

31.416—circumference of circle.

AREA—(Also see Table 5)

To find the area of a circle, multiply the square of the radius by 3.1416, or multiply the square of the diameter of the circle by 0.7854.

Example: Circle 10 inches in diameter; $10" \times 10" = 100$ sq. in.
 $\times 0.7854 = 78.54$ sq. in.

PRESSURE—(Also see Table 4)

To find the pressure in pounds per square inch, exerted by a column of water at its base, multiply the head in feet by 0.434. Thus in a pipe 50 ft. in height filled with water the pressure at its base will be 21.7 lbs.

For every pound pressure at the base of a column of water a height of approximately $2\frac{3}{4}$ inches is required.

Example: $50 \text{ ft.} \times 0.434 = 21.7 \text{ lbs.}$

CONCRETE AND CEMENT MIXTURES

Where concrete is used for outdoor grease and yard catch basins, cisterns, cesspools and septic tanks use one part Portland cement, two parts sand and four parts broken stone or clean gravel; or four sacks of Portland cement, 8 bushels

of clean sharp sand and 16 bushels of broken stone or clean gravel.

A mortar composed of one cubic foot of cement and two cubic feet of sand will cover four square yards of surface one inch thick.

TABLE I.

- 1 barrel Portland cement equals 4 bushels nominally
- 1 barrel Portland cement weighs 400 pounds
- 1 barrel Portland cement contains 4 cubic feet
- 1 bag Portland cement weighs 100 pounds
- 1 barrel Portland cement contains 4 bags

For mortar for average masonry of rough stone, estimate about one barrel of Portland cement and two to three barrels of sand to the cubic yard, depending on the character of the stone.

SEPTIC TANK CAPACITIES

In estimating capacities of septic tanks for ordinary household use provide at least four cubic feet per capita tributary to the tank; for school or similar buildings allow two cu. ft. per person. (Also see section 57).

RAINFALL IN WISCONSIN

The average annual precipitation or rainfall and snowfall, in Wisconsin is about 36 inches, ranging from 28 to 44 inches in various parts of the state. Maximum rainfalls of 1 inch in 10 minutes are not uncommon; drainage piping should therefore be adequate to carry this amount of run-off. A rainfall of one inch in depth on an area of one square foot will give a run-off of .62 gallons. Thus the run-off from a roof 25'x25', or 625 sq. ft. in area, would be 625x.62, or 388 gals; or from a covered or paved surface 50'x50', or 2500 sq. ft. in area, the run-off would be 208 cu. ft., or 1,550 gals.

RAINWATER LEADERS

Combination Main and House Drains. Based upon Kutter's formula for pipes flowing full of water and a rainfall of 1 inch in 10 minutes, the following table (II A) shows the maximum roof areas that should be made tributary to various sizes of pipes used as horizontal rain water leaders laid

at grades of $\frac{1}{8}$ ", $\frac{1}{4}$ ", and $\frac{1}{2}$ " to the foot. Since the main house drain serving as a combination drain (including rain water and sanitary sewage), or any branches thereof receiving discharge from plumbing fixtures, floor drains, etc., should not flow full, they should be one size larger than would be required for a horizontal leader at the corresponding grade. The vertical leader (downspout) may be one size smaller than is required for a horizontal leader laid at a grade of $\frac{1}{2}$ " to the foot as indicated in column "C".

In using the following table, therefore:

1. To Determine Size of Horizontal Rain Water Leader: Compute total area of tributary roofs and paved areas, then select the size of pipe which will carry the run-off from an equivalent or greater area at the grade at which the pipe must be laid.

2. To Determine Size of Main House Drain and Horizontal Branches Thereto: Proceed as above in No. 1 and take the next larger size pipe.

3. To Determine Size of Vertical Leader or Downspout: Proceed as in No. 1 above except that the grade is always considered $\frac{1}{2}$ " per foot as shown in column "C", then select the next smaller size pipe.

Example: Roof $25 \times 50 = 1250$ sq. ft.

From the table a 4" horizontal leader would be ample if laid at a grade of $\frac{1}{4}$ " or $\frac{1}{2}$ " to the foot, but if laid at $\frac{1}{8}$ " per foot a 5" pipe would be necessary. Similarly the size of the house drain required would be 5" for a grade of $\frac{1}{4}$ " or $\frac{1}{2}$ " per foot, and 6" for $\frac{1}{8}$ " per foot. A 3" vertical would be necessary.

TABLE II-A.

Size of Pipe	Roof or Surface Area in Sq. Ft.		
	A Grade $\frac{1}{8}$ " per foot	B Grade $\frac{1}{4}$ " per foot	C Grade $\frac{1}{2}$ " per foot
2-inch.....	162	229	324
3-inch.....	513	726	1,030
4-inch.....	1,160	1,640	2,320
5-inch.....	2,180	3,080	4,430
6-inch.....	3,630	5,150	7,270
8-inch.....	8,110	11,500	16,300
10-inch.....	15,100	21,400	30,200
12-inch.....	25,000	35,400	54,000
15-inch.....	46,200	65,400	96,000
18-inch.....	76,100	108,000	150,000

COMBINATION MAIN HOUSE DRAINS—COM- PUTING AND PROPORTIONING SIZES OF

Main house drains serving as combination drains (sanitary and rain water) may be determined for all practical purposes by computing the total horizontal surface area covered by the building or buildings and the paved surfaces to be drained. Drains so proportioned have been found in practice to be amply large and to give satisfactory results (Table II B), providing that no part of a vitrified clay house drain carrying the discharges from water-closets is less than a 6-inch pipe.

**TABLE II-B—SHOWING PIPE SIZES FOR COMBINATION MAIN HOUSE
DRAINS AND HORIZONTAL BRANCHES, BASED ON ROOF
OR COVERED AREAS IN SQUARE FEET.**

Diameter of Pipe	Roof or Surface Area in Sq. Ft.		
	A Grade $\frac{1}{8}$ " per foot	B Grade $\frac{1}{4}$ " per foot	C Grade $\frac{1}{2}$ " per foot
4-inch-----	1,500	1,800	2,500
5-inch-----	1,800	3,000	4,500
6-inch-----	3,000	5,000	7,500
8-inch-----	8,000	11,000	16,000
10-inch-----	15,000	21,000	30,000
12-inch-----	25,000	35,000	50,000
15-inch-----	46,000	65,000	96,000
18-inch-----	76,000	108,000	150,000

BARRETT'S FORMULA FOR COMPUTING VERTICAL RAIN WATER LEADERS

The following formula as given in Barrett's specifications for "Holt Roof Leader Connections" has been found in practice to give satisfactory results:

For vertical leaders serving roofs covered with gravel or slag with an incline not exceeding one-quarter of an inch per foot, allow 300 square feet of roof surface to each square inch, of leader opening; for roofs of greater incline or saw-tooth roof construction, 250 sq. ft. roof surface to each square inch of leader opening; for metal, tile, brick, slate, or similar roofs of any incline, 200 sq. ft. of roof surface to each square inch of leader opening.

Note: This formula is based upon the leader opening. The leader pipe is therefore in each case one size larger. (For cross sectional areas in square inch of various sizes of pipes, see Table V.)

BARRETT'S TABLE SHOWING SQUARE FEET OF ROOFING-SURFACE WHICH CAN BE DRAINED BY GIVEN SIZE OF LEADER-OUTLET.

	Size of Leader					
	2½"	3"	4"	5"	6"	8"
Roofs covered with gravel, slag or similar material with incline ¼" to 1'-----	1,800	1,800 to 2,200	2,200 to 3,600	3,600 to 5,600	5,600 to 8,000	8,000 to 14,000
Same with incline ½" to 1' or more and saw-toothed roofs---	1,200	1,200 to 1,700	1,700 to 3,100	3,100 to 4,900	4,900 to 7,000	7,000 to 12,000
Metal, tile, brick, slate or similar roofs of any incline-----	1,000	1,000 to 1,400	1,400 to 2,500	2,500 to 3,900	3,900 to 5,600	5,600 to 10,000

SANITARY HOUSE SEWERS AND DRAINS

The size of a main house sewer or drain or branches thereof serving as a sanitary sewer or drain constructed to conform with the provisions of section 4 (b) and Chart A (page 38), will prove adequate for all ordinary installations. No such sewer or drain should be of a lesser diameter than the largest line of pipe connected thereto.

In order to provide ventilation and prevent back pressure, sanitary sewers must be so designed as to flow not more than half full. A minimum velocity of 180 ft. per minute is necessary to assure proper scouring and thus reduce stoppages to a minimum. Based upon Kutter's formula for pipes flowing half full, velocity and carrying capacity of sewers laid at grades of 1-16" to $1\frac{1}{2}$ " per foot may be determined from Table II C.

TABLE II-C—GIVING VELOCITY IN FEET PER MINUTE AND DISCHARGE IN GALLONS PER MINUTE OF SEWER PIPE FLOWING HALF FULL LAID AT DIFFERENT GRADES.

	Size of Pipe, Inches				
	4-in.	6-in.	8-in.	10-in.	12-in.
	Grade $\frac{1}{2}$ " per foot				
Velocity.....	222	391	389	467	532
Discharge.....	70	220	492	914	1,460
	Grade $\frac{1}{4}$ " per foot				
Velocity.....	157	219	275	327	376
Discharge.....	50	156	347	646	1,070
	Grade $\frac{1}{8}$ " per foot				
Velocity.....	111	154	199	231	266
Discharge.....	35	109	245	456	750
	Grade $\frac{1}{16}$ " per foot				
Velocity.....	79	109	136	163	187
Discharge.....	26	80	178	332	549

Note: Values below the dotted line should not be used because of insufficient velocity.

WATER SUPPLY

In estimating hot water boiler capacities in plumbing installations a reasonably safe rule is to allow a 40-gallon boiler for a residence having one bathroom. The size, however, can be computed only by first ascertaining the quantity of hot water that may be drawn off at a given time. In addition to the capacity of the boiler, the heating agents employed in warming the water must be taken into consideration. Hot water consumption is computed generally on the basis of 10 gallons per capita per day.

Nothing but an approximate idea of the consumption of cold water can be given. It is generally estimated, however, at 20 gallons per capita per day.

The following sizes of water supply for fixtures, when pressure is not less than twenty (20) pounds, are generally considered good practice. There are, however, other conditions that must be taken into consideration.

Flush tanks should have a flushing capacity of not less than 3 gallons for water-closets and 1 gallon for urinals.

House service pipes must be connected to the street mains by means of corporation cock, and a stopcock or valve placed under the sidewalk at the curb, in compliance with the rules and under the supervision of the Department of Water Supply.

A separate stop or valve must be placed upon the service pipe inside the front wall.

The diameters of street service pipes must not be less than three-quarter inch for dwellings and tenements occupied by six families or less; one inch for tenements or apartment houses occupied by more than six families and one and one-half inch for hotels, factories and other miscellaneous buildings, provided that in no case can the diameter of the service pipes be less than the diameter of the tap installed under the supervision of the Department of Water Supply.

All rising lines should have a stopcock or valve at the foot of each line and in all buildings, except dwellings, a separate stopcock or valve should be placed on the branches from bathrooms, kitchens, etc., located so as to be accessible at all times. The diameters of all rising lines should be not less than three-quarters of an inch. Services from main in street or otherwise, to inside of building and above basement or ground floor should be of lead or cast iron.

Diameters of branches to any fixtures must not be less than one-half inch, except when used to supply water-closets, tanks or lavatories. When the material used is lead or brass pipe, the minimum diameter may be three-eighths inch. Branches for flush valves for water-closets must not be less than one and one-quarter inch in diameter and for urinals not less than three-quarters inch in diameter. For relative discharging capacities of pipes see Table 7.

Where a hot water supply system is installed the distance between the hot and cold water risers should be not less than six inches. Where it is impossible to place them six inches or more apart, the hot water riser should be covered with an approved insulating material and a method of circulation provided that will insure a prompt delivery of hot water at the faucet.

All risers and branches should be properly fastened.

When the water pressure is not sufficient to supply all fixtures freely and continuously, an elevated or air pressure tank should be provided of sufficient size to afford an ample supply of water to all fixtures at all times. Such tanks must be supplied from the pressure or by power pumps as may be necessary; when from the pressure, ball-cocks must be provided.

Such tanks must be made of suitable material, properly located and so installed as to prevent water contamination by foul odors from any source. .

All such tanks should be properly supported on iron beams or concrete piers. Wood may be used if of substantial construction.

The overflow pipe from elevated tanks must discharge into an open fixture or drain, and in no case shall be connected

directly with the plumbing system. Overflows of this type discharging large amounts of water or which have a constant flow may not under certain conditions discharge directly or indirectly into a private sewage treatment system. (See sewage disposal).

WATER REQUIREMENTS IN RURAL HOMES

Purposes and Conditions	Consumption per person for 24 hours Gallons
Domestic purposes, 1 pump at kitchen sink.....	8
Domestic purposes, 1 faucet at kitchen sink.....	15
Domestic purposes, running hot and cold water in kitchen, bathroom, and laundry.....	25
Sprinkling and cooling purposes, outdoor washing, waste, leakage, etc.	15
Average daily consumption, modern house.....	40
Maximum daily consumption, modern home.....	100
Average daytime consumption (7 a. m. to 7 p. m.)....	38

WATER CONSUMPTION BY FARM ANIMALS

As to the requirements of stock, animals prefer a living spring or a stream of pure, cool water, and will go a long distance to obtain it. If supplied from artificial sources, fair allowances are 12 gallons per day for each horse, mule, or cow, and 2 gallons per day for each sheep or hog. Heavily worked horses and mules and milch cows may consume 20 to 25 gallons per day in hot weather and with all farm animals conditions of weather, food and living may double or halve the ordinary requirements.*

* Farmers' Bulletin 941, United States Department of Agriculture, October, 1918.

EFFECT OF VARIATIONS OF TEMPERATURES ON WATER

Water freezes at 32° Fahr.

Water has a maximum density at 39.1° Fahr.

Water boils at 212° Fahr.

Water expands in freezing to about one and one-twelfth of its bulk, or from 1000 to 1083. Fifteen hundred and ninety-five cubic inches of water will expand in freezing to one cubic foot of ice, which weighs approximately 57.5 pounds.

Water is from 10 to 12 times heavier than an equal volume of snow. Water freezing in a pipe or closed receptacle exerts a pressure of approximately 2,000 pounds per square inch, which is the force that causes pipes to burst.

TABLE III—SHOWING GALLONS OF WATER IN VARIOUS SIZES OF PIPES OR TANKS ONE FOOT IN HEIGHT, $\frac{3}{8}$ INCH TO 144 INCHES

Diameter of pipe in inches	Volume in gallons per foot	Diameter of pipe in inches	Volume in gallons per foot
$\frac{3}{8}$ -----	0.005	27 -----	29.7
$\frac{1}{2}$ -----	0.010	28 -----	32.
$\frac{3}{4}$ -----	0.023	29 -----	34.3
1 -----	0.047	30 -----	36.8
$1\frac{1}{4}$ -----	0.064	31 -----	39.2
$1\frac{1}{2}$ -----	0.092	32 -----	41.8
2 -----	0.163	33 -----	44.5
$2\frac{1}{2}$ -----	0.255	34 -----	47.2
3 -----	0.367	35 -----	50.
$3\frac{1}{2}$ -----	0.500	36 -----	52.8
4 -----	0.652	37 -----	55.9
$4\frac{1}{2}$ -----	0.826	38 -----	59.0
5 -----	1.02	39 -----	62.1
$5\frac{1}{2}$ -----	1.23	40 -----	65.3
6 -----	1.47	41 -----	68.6
7 -----	2.00	42 -----	72.1
8 -----	2.61	43 -----	75.5
9 -----	3.30	44 -----	79.1
10 -----	4.08	45 -----	82.7
11 -----	4.93	46 -----	86.5
12 -----	5.87	47 -----	90.2
13 -----	6.89	48 -----	94.0
14 -----	8.00	54 -----	119.
15 -----	9.17	60 -----	147.
16 -----	10.44	66 -----	178.
17 -----	11.80	72 -----	211.5
18 -----	13.20	78 -----	248.4
19 -----	14.70	84 -----	288.1
20 -----	16.34	90 -----	330.8
21 -----	18.00	96 -----	376.3
22 -----	19.75	108 -----	477.3
23 -----	21.57	120 -----	589.0
24 -----	23.50	132 -----	712.7
25 -----	25.50	144 -----	848.2
26 -----	27.60	180 -----	1,325.3

Note: For weight, multiply volume by 8.33 (lbs. per gal.)

**TABLE IV—SHOWING PRESSURE OF WATER AT DIFFERENT
ELEVATIONS.**

Head in Feet	Pressure in lbs. per sq. in. at base	Head in Feet	Pressure in lbs. per sq. in. at base
1	.43	185	80.14
2	.86	190	82.30
3	1.30	195	84.47
4	1.73	200	86.63
5	2.16	205	88.80
10	4.33	210	90.96
15	6.49	215	93.14
20	8.66	220	95.30
25	10.82	225	97.49
30	12.99	230	99.63
35	15.16	235	101.79
40	17.32	240	103.96
45	19.49	245	106.13
50	21.65	250	108.29
55	23.82	255	110.46
60	25.99	260	112.62
65	28.15	265	114.79
70	30.32	270	116.96
75	32.48	275	119.12
80	34.65	280	121.29
85	36.82	285	123.45
90	38.98	290	125.62
95	41.15	295	127.78
100	43.31	300	129.95
105	45.48	310	134.28
110	47.64	320	138.62
115	49.81	330	142.95
120	51.98	340	147.28
125	54.15	350	151.61
130	56.31	360	155.94
135	58.48	370	160.27
140	60.64	380	164.61
145	62.81	390	168.94
150	64.97	400	173.27
155	67.14	500	216.58
160	69.31	600	259.90
165	71.47	700	303.22
170	73.64	800	346.54
175	75.80	900	389.86
180	77.97	1000	433.18

Note: For pressures not given in this table multiply head in feet by 0.434; the product will be the pressure per square inch at base.

TABLE V—CIRCUMFERENCE AND AREAS OF CIRCLES FROM 1 TO 35
INCHES.

Diameter		Circumference in inches	Area in square inches
1	inch	3.1416	.7854
1¼	"	3.9260	1.2272
1½	"	4.7124	1.7671
2	"	6.2832	3.1416
2½	"	7.8540	4.9087
3	"	9.4248	7.0686
3½	"	10.9956	9.6211
4	"	12.5664	12.5664
5	"	15.7080	19.6350
6	"	18.8496	28.2744
7	"	21.9912	38.4846
8	"	25.1328	50.2656
9	"	28.2744	63.6174
10	"	31.4160	78.540
11	"	34.5576	95.033
12	"	37.6992	113.098
13	"	40.8407	132.7323
14	"	43.9823	153.9380
15	"	47.1239	176.7146
16	"	50.2655	201.0619
17	"	53.4071	226.9801
18	"	56.5487	254.4690
19	"	59.6903	283.5287
20	"	62.8319	314.1593
21	"	65.9734	346.3606
22	"	69.1150	380.1327
23	"	72.2566	415.4756
24	"	75.3982	452.3893
25	"	78.5398	490.8739
26	"	81.6814	530.9292
27	"	84.8230	572.5553
28	"	87.9646	615.7522
29	"	91.1062	660.5199
30	"	94.2478	706.8583
31	"	97.3894	754.7676
32	"	100.5310	804.2477
33	"	103.6726	855.2986
34	"	106.8142	907.9203
35	"	109.9557	962.1127
36	"	113.0973	1,017.8760

Note: Area equals Circumference multiplied by 3.1416.

TABLE VI—CONVERSION TABLE: LIQUID TO CUBIC, AND VICE VERSA.

	Gills	Pints	Quarts	Gallons	Cu. In.	Cu. Ft.	Cu. Yds.
1 gill =	1.	.25	.125	.031	7.22	.00418	.000155
1 pint =	4.	1.	.5	.125	28.88	.0167	.00062
1 quart =	8.	2.	1.	.25	57.75	.0334	.00124
1 gallon =	32.	8.	4.	1.	231.	.134	.00975
1 cu. in. =	.139	.0345	.0173	.0043	1.	.00058	.00002
1 cu. ft. =	239.4	59.8	29.9	7.5	1,728.	1.	.037
1 cu. yd. =	6464.	1615.	807	102.5	46,656.	27.	1.

TABLE VII—SHOWING THE RELATIVE DISCHARGING CAPACITIES OF NEW SMOOTH PIPES.

	1½"	5⁄8"	¾"	1'	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"
1½"	1												
5⁄8"	1.7	1											
¾"	2.9	1.7	1										
1"	6.2	3.5	2.1	1									
1¼"	10.9	6.2	3.7	1.8	1								
1½"	17.4	10.0	6.0	2.8	1.6	1							
2"	37.8	21.7	13.0	6.1	3.5	2.1	1						
2½"	65.5	37.5	23.1	10.7	6.1	3.8	1.8	1					
3"	110.5	63.2	38.0	17.9	10.1	6.3	2.9	1.6	1				
4"	189.0	108.3	65.0	30.6	17.3	10.8	5.0	2.8	1.7	1			
6"	527	302	186	87	48	30.5	14.2	8	4.8	2.8	1		
8"		650	418	195.5	108.6	67.2	31.6	17.9	11.2	6.0	2.1	1	
10"								31.9	19.7	10.6	8.7	1.8	1

EXPLANATION OF TABLE OF RELATIVE PIPE DIAMETERS

The figures in the body of the above table give the number of pipes of a given diameter that are equal to one pipe of a larger diameter.

This table is based on conditions similar to those at a residence or other small building. For power plant or other similar conditions the table is only approximate.

Example: How many $\frac{1}{2}$ -inch pipes are equal to one $\frac{3}{4}$ -inch pipe?

Under column marked $\frac{1}{2}$ -inch at top of table follow down column to figures opposite $\frac{3}{4}$ -inch and read 2.9; that is to say, a $\frac{3}{4}$ -inch pipe has a carrying capacity equal to about three $\frac{1}{2}$ -inch pipes.

Example: What diameter of pipe will be required to supply three $\frac{1}{2}$ -inch pipes, one $\frac{5}{8}$ -inch and one $\frac{3}{4}$ -inch pipe?

Solution: Reduce all of the pipes to equivalent of $\frac{1}{2}$ -inch pipes.

Three $\frac{1}{2}$ inch pipes—3.0

One $\frac{5}{8}$ -inch pipe—1.7

One $\frac{3}{4}$ -inch pipe—2.9

The combination=7.6 $\frac{1}{2}$ -inch pipes.

From the table we see that a one-inch pipe equals 6.2 one-half inch pipes and a one and one-fourth inch pipe equals 10.9 one-half inch pipes. As we require the equivalent of 7.6 one-half inch pipes, it would be necessary to use a one and one-fourth inch pipe to supply the above combination.

PRIVATE WATER SUPPLY AND SEWAGE DISPOSAL

Section 56. (a) Public Water Supplies. The plan and specifications for all public water supplies must be submitted to the State Board of Health for approval before such system can be legally installed. (Chapter 447, Laws of 1919, known as Sections 1407m—1 to 1407m—4, inclusive, of the Statutes.)

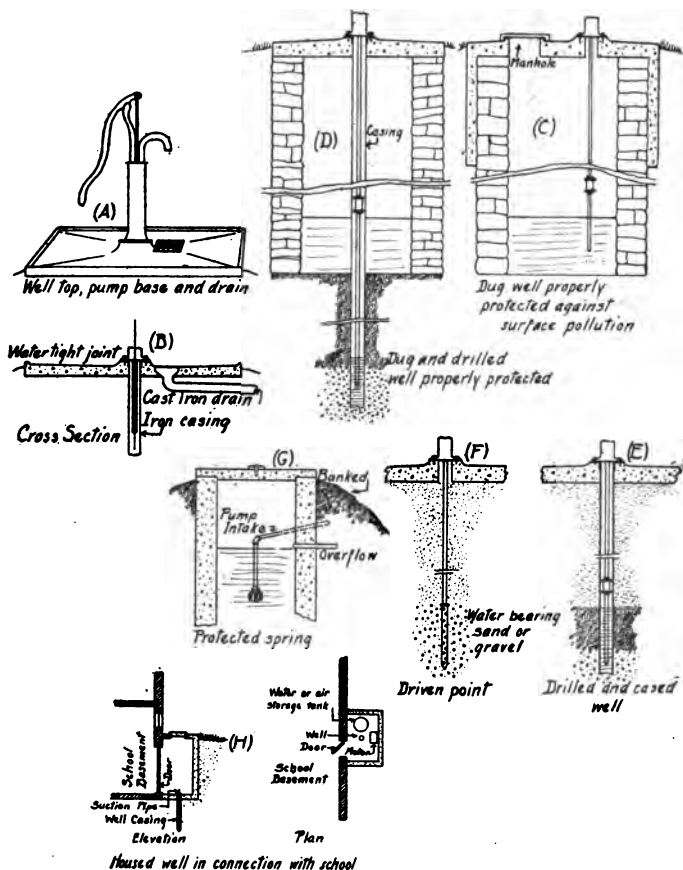
(b) Private Water Supplies. All private water supplies hereafter constructed shall be from a well, spring, lake or flowing stream which is not contaminated and which can be protected readily from contamination. Where possible all wells shall be cased with iron or steel, or curbed with vitrified pipe or concrete to the level of the water in the well, or deeper. The top of the well must be protected from surface water and drippings by a water-tight platform. Springs used for water supplies shall be adequately curbed with vitrified pipe or concrete, so as to be protected against pollution. All spring, lake or stream supplies known to be subject to occasional pollution must be either discontinued or made safe by filtration or sterilization with hypochlorite or other similar disinfectant which is not dangerous to human life, or as otherwise directed by the State Board of Health. (See sketch 54.)

(c) Private Water Supply Systems. All private water supply systems serving public school and similar buildings and plumbing and drainage installations in connection therewith shall be of sufficient capacity and size to provide adequate flushing facilities in order to maintain the plumbing fixtures at all times in a sanitary condition. No water supply serving a public school or similar public building shall come from a well or spring situated within apparent danger of pollution.

(d) Wells and Pumps. Pumps for dug wells shall be placed on a water-tight concrete, cement-faced platform not

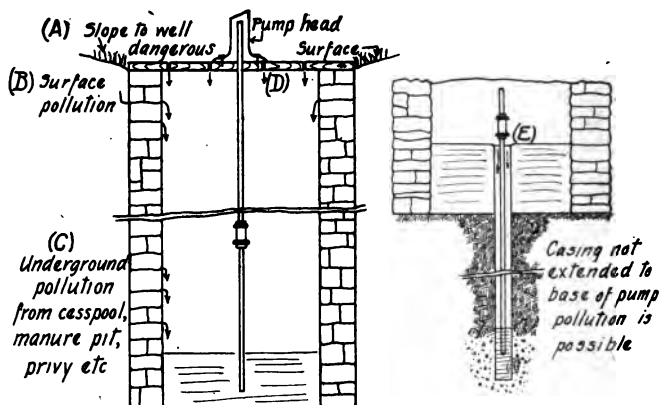
less than six feet in diameter; for drilled or driven point wells, on a platform not less than 4 by 4 feet.

The platform shall be placed at least six inches above the natural grade line, and graded up around same to within two



Sketch No. 54.—Illustrating construction of well and tops, joining of pump base to well top, and showing dug well, dug and drilled well, drilled and cased well, driven point well, in-cased spring, and manner of protecting against pollution. Sec. 56.

inches of the top of the platform in such manner as to conduct all surface water away from the pump and well. The pump when placed over the well shall be attached directly to the well casing in drilled wells, and to the platform in dug wells, in such a manner as to insure a water-tight joint. Pumps located in pits over the well or within buildings shall



Springs, driven points and shallow drilled wells if not properly protected are also subject to surface or underground pollution.

Sketch No. 55.—Illustrating common sources of well pollution.
Sec. 56.

have the intake or delivery pipes so extended into the well or spring that they cannot become a factor in the pollution of the water supply. (See sketches Nos. 54 and 55.)

Note: For data on water supplies of Wisconsin see Bulletin No. 35 of the Wisconsin Natural History Survey, or Bulletin No. 106 of the University series; also Wisconsin Code for Water, Sewerage and Refuse Disposal, issued by the State Board of Health.

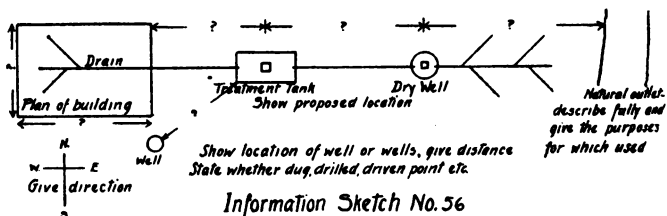
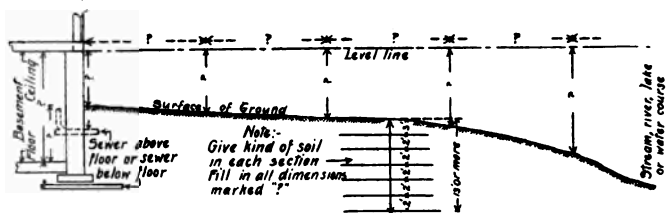
SEWAGE TREATMENT AND DISPOSAL PLANTS FOR RURAL BUILDINGS OR WHEN A PUBLIC SEWER IS NOT AVAILABLE

Section 57. (a) **Sewage Disposal Plants.** Septic, biological or other sewage treatment and disposal tanks may be constructed and used where no public sewerage system is available or likely to become available within a reasonable time, or in rural districts.

(b) **Permission to Construct.** Permission to construct same must be obtained from the local plumbing inspector in cities or villages where such office is maintained; otherwise from the local health officer or State Board of Health.

Note: This provision, so far as is essential and practicable, is intended also to cover rural districts. This is required so that the health officer may know where sewage disposal plants will be located with reference to the availability of public sewers or the pollution of a public or private water supply.

To guide properly those seeking information on private sewage disposal, it is essential that the department be supplied with adequate data as to existing conditions, including kind of building and number of occupants served, character of soil to a depth from 12 to 15 feet, topography of the land, availability of a natural outlet, source of water supply, whether a dug, drilled or driven point well, or spring, distance from the proposed disposal site, and such other data as may have a bearing on the subject. This can be done best by a rough pencil sketch adequately showing the situation. In cases where such information cannot well be detailed in writing, field men of this Bureau will visit the premises by arrangement to determine the type of sewage disposal to be employed. Such requests where possible should be made a reasonable time in advance of the desired visit by the inspector, so that they may receive attention without undue expense and within the time desired. (See information sketch No. 56.)



Sketch to be followed when applying for information for sewage disposal systems.

(c) **Materials, Capacity and Location.** All tanks of this kind to receive domestic sewage shall have one or more compartments constructed of substantial water-tight materials. The sewage from the building shall be discharged into a treatment tank and thence by inverted outlet to a leaching compartment, drainage tile or filter beds, or into a permissible natural outlet. (Study carefully sections 56, 57 and 58 and accompanying sketches, also "Suggested Methods," page 152.)

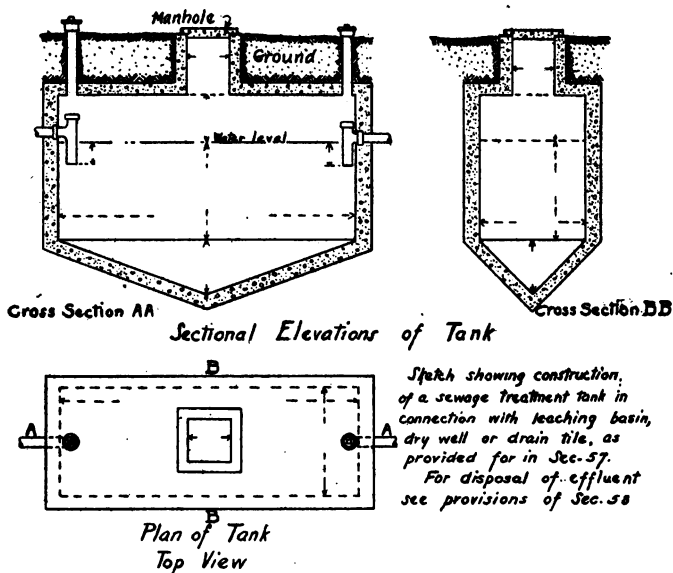
The size of the tank should be based on the number of persons using the building to be served. The treatment tank shall have a liquid contents capacity equivalent to a flow of 30 gallons of sewage (4 cu. ft. per person per day). But every such tank should have a capacity of not less than 32 cubic feet (2 ft. wide, 4 ft. long and 4 ft. deep) below the bottom of the outlet pipe. Where unusually large volumes of laundry or other clear water are tributary to the tank the capacity should be increased in the ratio of one cubic foot of space to every 20 gallons of such surplus water.

The discharge of surface and rain water leaders and cistern and other overflow pipes carrying large amounts of clear wa-

ter into a septic, biological or other tank used for the treatment of sewage is prohibited.

All tanks shall be constructed with the longest dimensions parallel to the direction of the flow, which should be at least twice the width, and of a depth of not less than four feet below the outlet.

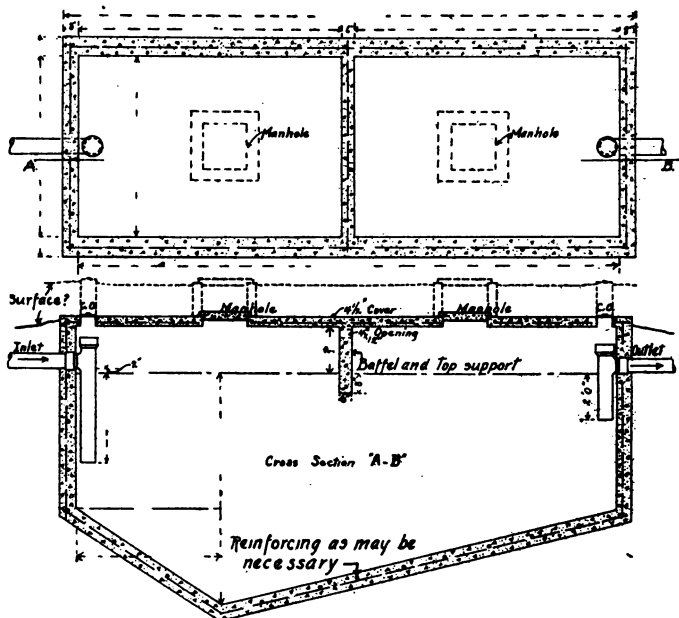
Both the inlet and the outlet shall be submerged below the level of the water in the tank. The tank shall be provided with at least one manhole and cover. (See sketch No. 57.)



Capacity of tank	Thickness of walls
Length (inside)	Size of inlet
Width (inside)	Size of outlet
Depth (From water level to hopper line)	Size of manhole

Sketch No. 57.—Illustrating a small domestic sewage treatment tank. Sec. 57 (c).

For schoolhouses or other public buildings, the minimum capacity of the tank shall not be less than two cubic feet per person, per day. (See sketch No. 58.)



Sketch No. 58.—Illustrating design and construction of a large domestic sewage treatment tank for school or other public building. Sec. 57 (c).

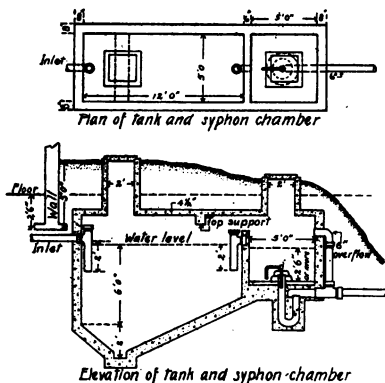
No water-tight compartment of the system shall be located within 2 feet of any lot line or 10 feet of any cistern or 20 feet from any well, spring or other source of water supply used for domestic purposes, and where practicable greater distances should be provided.

Note: Various types of disposal systems, inexpensive and effective, are shown under "Suggested Methods," (page 152), and are primarily intended for the disposal of household wastes. There are numerous designs of tanks and systems, such as the "Ashley," the "Kewanee," the "Imhoff" and the "activated sludge process," which if properly constructed and operated are, under normal conditions, efficient. Anyone desiring to install such a system should first consult some competent person familiar with these systems as they require careful designing and attention when operated.

(d) **Effluent from Tank.** The liquid flowing from a sewage treatment tank shall be discharged into a leaching basin,

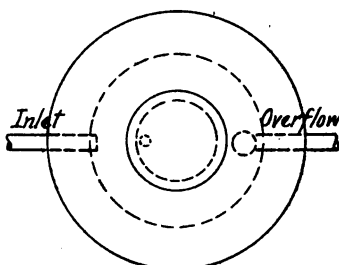
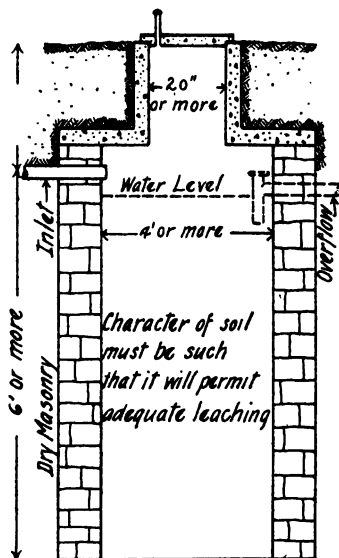
drainage tile, filter beds (see section 58 and accompanying sketches), or a water course which is not used as a water supply for domestic purposes and providing such disposition does not cause a nuisance or objectionable pollution.

Note: When the effluent of any form of tank is discharged into drain tile or upon filters it is recommended that it pass first into a chamber provided with an adequate siphon which will discharge the contents of the chamber periodically into the tile or upon the filters. Because these siphons are liable to operate continuously, due to lack of air or excessive discharge from the septic tank (which is especially true of siphons smaller than 4-inch), it is recommended that at least a 4-inch siphon be used unless a larger one is required. If a siphon is used, it should be given regular attention. Its use is not necessary nor advisable except when the dry well is to serve as a sprinkling filter or when a drain tile, absorption system or underground filter trenches are employed. (See sketch No. 59.)



Sketch No. 59.—Showing a sewage treatment tank equipped with automatic siphon. Sec. 57 (d).

Section 58 (a). The dry well shall consist of a chamber or well walled up with material which allows water to percolate through it, such as dry rubble or dry brick work. The bottom shall be left open to the soil. The dry well should not be less than 4 feet in diameter and should have a depth, where practicable, of 6 feet or more below the inlet pipe, depending on the character of the soil. It shall be equipped with a manhole, cover and fresh air inlet. The capacity of this compartment shall be such as to provide 1 square foot



Sketch No. 60.—Illustrating construction of a dry well. Sec. 58 (a).

of percolating surface (including bottom) to every 5 to 10 gallons of water per day tributary to the compartment. The lower limit is to be taken for clayey or compact soil and the upper limit for sand and gravel. (See sketch No. 60.)

Note: The use of a dry well or leaching drain for disposing of the effluent is not recommended except in cases where there is no possible danger of polluting a private or public water supply or where the use of drain tile or filter beds is impracticable. As usually constructed, a leaching basin or dry well does not provide as good facilities for purifying the effluent as filter beds or drain tile laid near the surface of the soil.

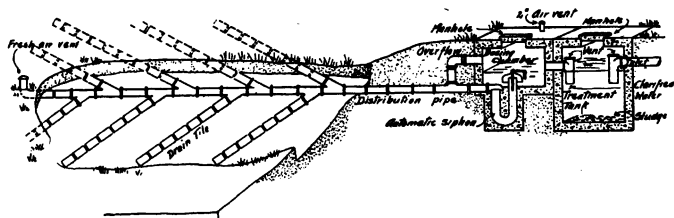
(b) **Dry Wells—Where Located.** A leaching basin or dry well compartment shall not be located where there is any danger of contaminating a water supply, well, spring, lake or stream, or of causing a nuisance. Where possible, the leaching compartment shall be located at least 50 feet from any dwelling or cistern and at least 150 feet from any surface well or spring. It may be permitted within 50 feet of a drilled well where the casing extends 100 feet below the surface of the ground and is driven firmly into rock. (See section No. 56.) No abandoned water supply well shall be used as a cesspool or leaching compartment for a sewage disposal.

Note: The limits of distances given in the above paragraph shall be taken as the lowest limit of safe distances between the dry well and the source of water supply. The danger of contamination depends almost entirely upon the character of the soil into which the sewage is discharged and upon the length of time the leaching compartment has been in use. A clayey soil full of seams, a porous rock or one full of crevices, or a very coarse gravel will allow the effluent from the leaching basin or dry well to flow directly to the well with little or no purification. A sandy or gravelly soil is the safest in which to locate leaching basins, dry wells or drain tile. Where the owner's lot is too small to attain the distances given in this section between the well and the leaching compartment, the well should be located as near one end of the lot as possible and the leaching compartment of the disposal plant as near the other end as possible, unless by so doing the owner would be contaminating his neighbor's well.

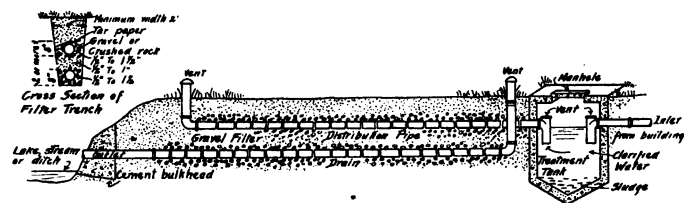
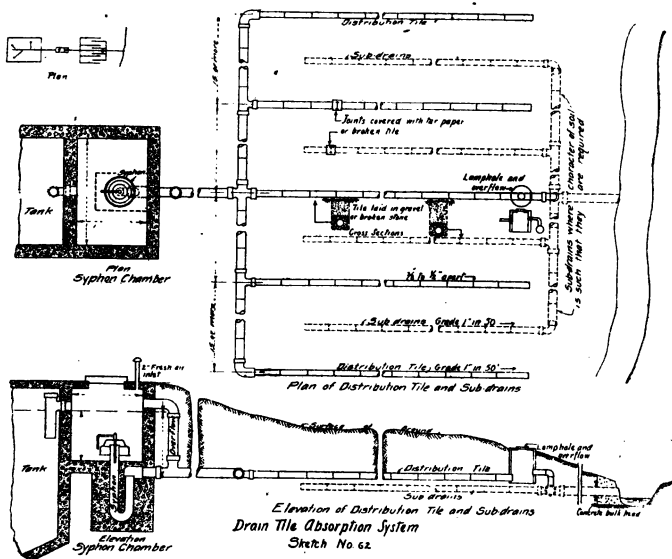
(c) **Drainage Tile and Siphon.** Drainage tile should be used in place of a dry well where the surface soil for a depth of 3 to 6 feet is sandy or gravelly. The drainage tile should be laid from 1 to 3 feet below the surface of the ground and in a very slight grade away from the tank (about 2 inches

in 100 feet). The tile should be laid in straight or curved parallel lines 15 feet or more apart. The joints should be left one-fourth to one-half inch apart and the tops blinded with burlap, tar paper or broken tile. The amount of tile laid should be based on 20 to 100 feet per person tributary to the tank, according to the character of the soil. The effluent from the tank should be discharged into the tile by an adequate automatic siphon, located in a chamber adjacent to the tank.

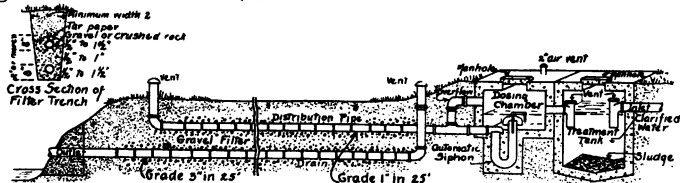
The capacity of the siphon chamber below the water line must be equal to the cubic contents of the tile required for the particular installation and must have a water head sufficient to insure proper siphonic action. (See sketches No. 61, 62, 63 and 64.)



Sketch No. 61.—Illustrating sewage disposal system consisting of treatment tank, dosing chamber, siphon and drainage tile. Sec. 58 (c).



Sketch No. 63.—Illustrating sewage disposal system consisting of treatment tank, dosing chamber, syphon and underground filter. Sec. 58 (c).



Sketch No. 64.—Illustrating a sewage disposal system for a small home, consisting of a treatment tank and underground filter, without a syphon chamber. Sec. 58 (c). See also "Suggested Methods."

Note: Each foot of 3-inch drain tile has a capacity of .367 gallons; 4-inch tile, .652 gallons; 5-inch tile, 1.02 gallons; 6-inch tile, 1.46 gallons; 7-inch tile, 2.012 gallons; 8-inch tile, 2.599 gallons; 10-inch tile, 4.0195 gallons; 12-inch tile, 5.875 gallons. The amount of tile required is governed by the lay of the land and character of the soil. This is important and must receive careful attention. The drainage tile should be laid approximately one foot below the surface of the ground, and in cases where it is necessary to lay the tile deeper than two feet, an adequate system of ventilation should be provided.

(d) **Manhole and Cover.** All water-tight treatment tanks, siphon chambers, dry wells, or similar units shall be provided with adequate manholes extended to the surface of the ground so as to make the interior readily accessible for examination and cleaning. All such manholes shall be equipped with an adequate concrete, stone or cast-iron cover. (See sketches No. 57 to 64, inclusive.)

(e) **Method of Ventilation.** All sewage disposal systems shall be ventilated in such a manner as to create a free circulation of air throughout the installation by the placing of fresh air inlets, extending not less than 10 inches above the ground, at the points shown in the sketches. No such fresh air inlet shall be placed within 20 feet of any window, door or other air intake in connection with any building used for human habitation. (See sketches No. 57 to 64.)

Note: Free circulation of air as provided for in this section means air entering through one or more fresh air inlets, passing on through the units and piping in connection therewith, thence through the inverts of the treatment tank by means of the vent openings, and the air continuing onward through the house drain, soil, waste and vent pipes to a point above the building, thus not only creating an effective circulation of air but conveying all offensive odors and gases to a point above the roof.

(f) **Piping.** The drain extending from the building to the treatment tank may be made either of vitrified clay pipe or cast iron, installed in the manner prescribed in this Code for house drains.

The inlet to the treatment tank shall be of adequate size and must enter the tank above the water level and be provided with an inverted cast iron tee as shown in sketches.

The outlet from the treatment tank leading to the dry well, filter trench, or other disposal unit or terminal, must be not less than a 4-inch cast iron pipe, equipped with an inverted tee placed in the wall of the tank as shown in the sketches,

and the bottom of the outlet pipe shall be at least 2 inches lower than the bottom of the inlet pipe. (See sketches.)

The pipe leading from the treatment tank may be either cast iron, vitrified clay, or its equivalent.

If the inverts are not used, baffle boards must be provided to keep floating solids from entering the dry well, filtration trench or other disposal unit or terminal.

(g) **Removal of Sludge and Care of Tank.** All sewage treatment tanks must be cleaned out whenever the sludge contents rise to a point where they occupy one-third of the cubic contents of the tank. Sludge removed from a sewage treatment tank or its units must be hauled away, buried or disposed of in such a manner as not to create objectionable conditions or cause a nuisance.

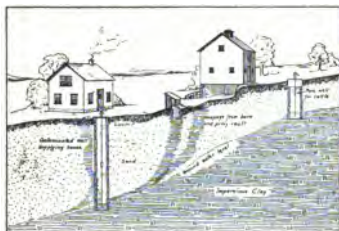
(h) **Cesspools Prohibited.** No cesspool or other system for sewage disposal shall be constructed where a sewer is available, nor shall any connection from such cesspool be made with any sewer.

Cesspools now existing in premises accessible to a sewer, and cesspools that may hereafter become accessible to a sewer, must be discontinued and when necessary emptied of their contents and filled with earth or ashes, and the house sewer shall be disconnected from the old cesspool and be reconnected with the public sewer.

PRIVY VAULTS

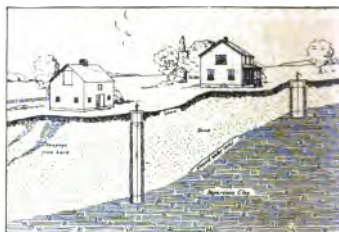
Pursuant to authority conferred by the statutes, municipalities may by ordinance cause the discontinuance of privy vaults where public water supply and sewers are available. Such ordinance may be either of the blanket or zone type, and should contain provisions requiring that no privy vault shall hereafter be constructed or maintained where public water supply and sewerage are available, and that where such facilities are not available no privy vault, manure pit or other reservoir hereafter constructed which is used as a receptacle for human excreta, shall be located within 2 feet of any lot or alley line or within 20 feet of any street line or building used for human habitation. Such privy vault shall be located

at least 25 feet from any cistern, well, spring, or other source of water supply used for drinking purposes. All privy vaults hereafter constructed shall be made fly-proof. (For examples of privies improperly and properly located, respectively, with relation to wells, see following sketches, No. 65 and 66.)



SKETCH NO. 65
BUILDINGS IMPROPERLY LOCATED
The natural drainage is toward the well, not away from it. The top of the well is not protected from surface contamination.

Sketch No. 65—Buildings improperly located. The natural drainage is toward the well, not away from it. The top of the well is not protected from surface contamination.



SKETCH NO. 66
BUILDINGS PROPERLY LOCATED IN RELATION TO WELLS
Showing natural underground drainage away from the wells, and the top of the wells protected from surface pollution.

Sketch No. 66.—Buildings properly located in relation to wells. Showing natural underground drainage away from the wells and the tops of the wells protected from surface pollution.

SUGGESTED ZONE ORDINANCE

AN ORDINANCE PROVIDING FOR THE REMOVAL OF PRIVIES WITHIN CERTAIN LIMITS FOR THE BETTER PROTECTION OF PUBLIC HEALTH AND PROVIDING A PENALTY

The Mayor and Common Council (or Village Board) of the of do ordain as follows:

Section 1. No outhouse, privy or vault shall be built, constructed or maintained upon any lot or part of lot in the or, State of Wisconsin, lying and being within the following bounds, providing public sewer and water are available.

(Define here fully the district in which privies are to be abolished by block and street name, or other established boundary lines, as the case may be. In this manner the more congested districts may be properly cared for.)

The owners of all such lots where privies are not used, shall connect with the sanitary sewer system in a proper manner. All closets, outhouses and privies within the territory hereinabove described shall, within one year from the passage and publication of this ordinance, connect properly with the sanitary sewers of said, when available, or be removed, and all such closets, outhouses and privies not so connected or removed are hereby declared to be a menace to health and a nuisance.

Section 2. It shall be the duty of the health officer and attorney to strictly enforce the provisions of this ordinance and see that all violations thereof are abated as herein provided, and it shall be the duty of the street commissioner or police officer to investigate and report in writing to the any violations of this

ordinance. Said thereupon shall serve notice to abate such privy or outhouse and connect with the sewerage system in compliance with this ordinance.

Section 3. Any person, firm or corporation violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined not less than five dollars nor more than one hundred dollars, together with the costs of prosecution, or imprisonment in the county jail not exceeding sixty days for each and every violation thereof. Each day of such violation shall constitute a separate offense.

Section 4. All ordinances or parts of ordinances in conflict with the provisions of this ordinance are hereby repealed.

Section 5. This ordinance shall take effect and be in force 30 days from its passage and publication.

Passed

Approved

Published Attest:

SANITARY PRIVY REQUIREMENTS

Requirements for a sanitary privy as set forth by the State Board of Health are as follows:

1. It must be located and constructed so that there is absolutely no danger of a water supply being contaminated.
2. It must be so constructed that small animals or vermin cannot in any way get to the excreta.
3. It must be fly-proof.
4. It must be so constructed that it can be kept in a sanitary condition without too much labor.
5. It must be one that can be constructed at a minimum cost.
6. It must be safe against overturning and must afford a reasonable amount of protection from the weather to the user.
7. While it is desirable that the privy make as neat an appearance as possible, the appearance must be second to utility.
8. The vault must be as dark as possible and should be provided with an effective ventilator extended above the roof. The shelter house should also have a means of ventilation and be adequately lighted.

For blueprints outlining the type and method of construction of a sanitary privy for home, school, office or industry and embodying the points necessary to satisfy the above requirements, write the Bureau of Plumbing and Domestic Sanitary Engineering, State Board of Health, Madison, Wis. Everyone who does not have the advantages of a public or private sewer system is advised to have a privy of this sort. Old, insanitary privies should be replaced at once by the sanitary type.

For Chemical and Dry Closets in Connection with School-houses See Wisconsin Rural School Chemical and Dry Closet Code, Issued by Wisconsin State Board of Health.

For Water-Flushed Systems for Schools, Communicate with the Bureau of Plumbing and Domestic Sanitary Engineering, State Board of Health, Madison, Wis.

SUGGESTED METHODS FOR DISPOSAL OF SEWAGE BY TREATMENT TANK PLAN, FOR HOMES AND OTHER SMALL IN- STALLATIONS, WHERE PUBLIC SEWERAGE IS NOT AVAILABLE

APPROVED METHODS FOR SEWAGE EFFLUENT DIS- POSAL FOR SMALL RURAL INSTALLATIONS

The illustrations shown (pages 180 to 197) outline approved plans for installing sewerage systems in homes by the treatment tank method. These plans consist of a treatment tank and various methods for disposal of the treated effluent, each depending upon the particular lay of the land, character of the soil, and other conditions existing. It is essential that the system be selected in accordance with the special instructions given on the sketches. Also see sections 56, 57 and 58 of the Code.

Where references are made on the sketches to certain numbered blueprints, copies thereof may be obtained from the Bureau of Plumbing and Domestic Sanitary Engineering.

A feature in the development of rural life during recent years has been the construction throughout the state, especially in the more developed communities, of modern farm homes and other buildings.

Many farm homes are now equipped with electric light and power. Modern labor-saving devices which at one time were thought to be available only for the city dweller are now being installed on the farms.

There has been among some a tendency to postpone the installation of modern plumbing owing to lack of general information by plumbers, architects and laymen alike in designing and installing sewage disposal systems that will function satisfactorily under the various conditions existing.

When a public water supply or sewerage system is not available, an efficient, durable and satisfactory water system of the "compressed air storage" or "air pressure delivery" type, and a sewage treatment and disposal system can, in most cases, be installed at a reasonable cost, considering the protection and comfort afforded. (Fig. A.) There are doubtless some localities in the state where adverse conditions make impossible the proper disposition of effluent from a sewage treatment tank. In such cases a sanitary privy or other approved conveniences should be provided. Such conditions include the lack of a natural outlet (lake, river stream or ravine), and topography of the land or non-absorbent character of the soil. In every case the designer or installer should make a full investigation of all factors to be considered in determining what system of water supply and sewage disposal should be adopted, and the Bureau of Plumbing and Domestic Sanitary Engineering of the State Board of Health will upon request assist in making such investigation. In all cases where doubt may exist as to the correct procedure, it is recommended that the installer correspond with the Bureau before proceeding with the installation. (See section 57 (b) of the State Plumbing Code, and information sketch No. 56.)

Attention is directed to the importance of determining the adequacy of drainage possibilities before selecting a site for building purposes. This is especially necessary in all cases where large amounts of sewage or water-carried wastes are to be disposed of from buildings, such as schools, institutions, dairy and industrial plants.

In sections 56, 57 and 58 of the State Plumbing Code, specific requirements are prescribed relating to permission to install and to the location and construction of private sewage disposal systems where public sewerage systems are not available. It is with a view to supplementing these specific regulations and meeting requests for aid in the construction and operation of private sewage disposal systems for rural homes and other unsewered buildings that the following suggested methods are offered.

The various systems shown are either identical or similar to several thousand systems which have been installed in this state during the past ten years and which in operation have been found to work satisfactorily providing due care is exercised in the selection of the system to meet existing conditions and proper attention is given in operation.

These systems consist of a treatment tank and various methods for the disposal of treated effluent, each depending upon the particular lay of the land, character of the soil and other conditions existing. (See Figures, pp. 180 to 197.)

It is essential that the designer or installer take carefully into consideration the existing conditions, including kind of building, number of occupants served, estimated volume and character of the sewage to be treated and disposed of, topography of the land and character of the soil to a depth from 12 to 15 feet if the effluent is to be disposed of by soil absorption. The topography of the land with relation to the availability of a natural outlet is also a factor which should be considered.

Other important factors are source of water supply, character and depth of the well, whether dug, drilled or driven point, or spring, distance of the well or spring from the proposed disposal unit, and other data as may have a bearing on the subject.

The type of plumbing equipment and its use with relation to maximum water consumption must also receive careful consideration.

SEWAGE TREATMENT AND DISPOSAL

Sewage from a farm or summer home, hotel, rural school, place of industry or other similar building may be defined as waste water (water-carried wastes) from water-closets, baths, sinks, wash-basins, laundry tubs, floor drains and similar fixtures. These wastes may be disposed of in one of the following ways, providing due care is exercised so as not to create a nuisance or objectionable conditions:

1. By discharge into subsoil;
2. By discharge into a river, stream or dry run (by permission);
3. By discharge into a pond or lake (by permission);
4. By discharge upon the ground surface where feasible.

Necessity for Treatment. Each of these methods of disposal requires some form of preliminary treatment to remove a portion of the solids and to make possible the satisfactory disposal of the liquid effluent, otherwise a serious nuisance or objectionable condition may be created, and may result in polluting the water supply or otherwise endangering health.

Cesspools. A cesspool as ordinarily used may be defined as a hole in the ground the sides of which are cribbed with wood or stone laid up loose so as to allow the liquids to escape into the ground. The solids in the sewage settle to the bottom, and unless the soil is of loose formation, such as coarse gravel, will soon choke the voids in the earth and result in reducing in part or in whole the absorption qualities of the soil and thus render the disposal medium useless. For this reason and because of the greater danger of pollution of the water supply and of creating objectionable conditions, cesspools should not be used as a medium for the disposal of sewage. (See also section 58 (h), "Cesspools Prohibited," of the State Plumbing Code.)

Septic Tanks. The septic sewage treatment tank is the simplest and most practical form of treatment to reduce the

suspended matter contained in water-carried waste and to render the sewage more readily capable of final disposal with minimum possibility of a nuisance or objectionable conditions being created.

All tanks of this kind receiving domestic sewage should have one or more compartments into which the sewage from the building is discharged, thence flowing by an inverted outlet to a disposal unit consisting of a leaching compartment (dry well), absorption trench, tiled absorption field, filter beds, or a properly designed and constructed combination of either of the above units, or into a permissible natural outlet, as the case may require for satisfactory disposal of the sewage effluent. (See Figures.)

HOW THE SEPTIC TANK FUNCTIONS

The purpose of the septic tank is to assist and expedite the natural process of decomposition and putrefaction.

Two simple changes take place in such a tank:

The first is the settlement of the solids to the bottom, the grease and lighter particles floating to the top.

The second is the decomposition of the settled solids.

This is brought about by the detention of the sewage and its decomposition by the action of a certain type of bacteria which multiply in the solids and in the scum which forms on the surface of the tank.

These bacteria thrive without oxygen and break up the solids into liquid and gases. It should be observed that the above is all that a septic tank accomplishes.

The sewage treatment tanks shown in these illustrations are designed to provide a one-day retention period to promote septic action. Bacterial or biological action comes from millions of bacteria, called aerobes and anaerobes, the latter thriving in the organic matter without light or air in the deep part of the tank. Most all organic matter pertaining to domestic sewage entering the tank is broken up and liquefied except a small portion (referred to as sludge), which is found at the bottom of the tank. Chemicals of all kinds must be excluded from the tank, as they retard or destroy the septic action.

The process of further purification of sewage effluent as it leaves the septic tank may briefly be described as follows:

Bacteria of the aerobic type, thriving only where there is air, and working under favorable conditions, tends to produce further purification. These bacteria are present in all soils near the surface, and usually are not found at a depth greater than two or three feet below the surface, except where favorable conditions are created. Like the anaerobic type they multiply prolifically when sewage effluent is fed to them, as in the case of some of the methods for effluent disposal here-in suggested.

The statement has often been made that sewage after passing through a septic tank has undergone a 90 per cent purification, and many have conveyed the idea that the effluent from a septic tank if properly designed and operated should be fit to drink.

It is hoped that these illusions may cease to exist, for the effluent from a septic tank may be just as dangerous to health as the raw sewage which is discharged from the building drain.

A septic tank, provided it functions properly, removes the greater part of the solids from the sewage. But it does not necessarily remove or destroy all disease organisms which may be present in the sewage as it enters the tank.

Nor is the effluent free from offense. If allowed to pond on the surface of the ground it may create a nuisance. If it finds its way into the source of a water supply it will eventually result in contaminating the water. If discharged into a stream of insufficient volume to make for proper dilution it may result in pollution of the stream to such an extent as to create dangerous conditions for man and beast and fish life.

A septic tank will not continue to operate indefinitely without attention. The purpose of the septic tank is to liquefy the solids. However, a certain amount of solid matter will accumulate in the tank and require removal under normal conditions usually once yearly, or whenever the sludge exceeds a depth of from one-fourth to one-third of the liquid

contents depth of the tank. For this reason manholes must be provided.

Location of the Treatment Tank. The depth of the excavation necessary for the tank may be greatly reduced if advantage is taken of any natural fall in the ground surface.

The soil pipe should extend from the house at a point nearest to the location of the tank.

Too frequently the plumbing installation within the building is partly installed or completed before proper consideration is given to the location of the sewage treatment tank and disposal unit, resulting in the location of the disposal system to suit the building outlet drain, which may bring about adverse conditions.

Owing to the possibility in cold climates of frost penetrating to a depth from 5 to 7 feet during extremely cold winters, or other unfavorable soil conditions, it may be necessary to protect the tank contents and the drain leading from the building to the tank and the disposal unit against frost. For this reason it may be preferable in some instances to locate the septic tank close to the building or comparatively near a source of water supply.

In such cases every precaution must be taken to make the tank and piping leading to and from it absolutely water-tight. The wall of the basement or building must under no circumstances be used as part of the tank, which must be so built as to constitute an independent structure. The inside of all septic tanks so located that water-tight construction is essential must be finished with a coating of cement mortar at least $\frac{3}{4}$ inch thick, smoothly troweled and of a mix of one part cement and one of sand. (See Fig. C 12.)

The sewage treatment tank should not be situated near a window or door. Under certain favorable conditions the tank may be thus located, or placed within the building itself, provided it is of water- and air-tight construction, including manholes and covers, and there is satisfactory provision for the removal of sludge. The general rule, further, is not to locate a treatment tank within 2 feet of any lot line, 10 feet of any cistern or 20 feet from any well, spring or other source of water supply used for domestic purposes, and where practicable to do so greater distances should be provided.

Size and Construction of Septic Tank. The minimum dimensions of any septic tank should be 2 feet 6 inches in width by 5 feet in length and 5 feet deep below the outlet pipe. This size of tank may be used in all installations for six persons or less.

The minimum dimensions of a septic tank for 12 persons or less should be 3 feet wide, 6 feet long and 5 feet deep below the outlet. (Fig. B.)

For larger installations the capacity of the tank should be equal to 24 hours' flow of sewage, estimating such flowage for residences at 30 gallons per occupant per day. (Figs. C 1, C 2 and C 3.)

Where unusually large volumes of laundry or other clear water are tributary to the tank the capacity should be increased in the ratio of one cubic foot of space to every 20 gallons of such surplus water.

For schools equipped with individual modern closets, bowls, urinals, wash basins, drinking fountains and customary floor drains, base the tank liquid contents capacity on 15 gallons per pupil. Thus with a school attendance of 50, we have $50 \times 15 = 750$ gallons $= 100$ cu. ft. $=$ a tank 3 ft. wide, 7 ft. long and 5 ft deep below the outlet pipe.

For places of employment (domestic sewage only), allow 15 gallons per person plus any other waste waters tributary.

For institutions allow from 60 to 100 gallons per day, depending on the character of the institution.

It should be remembered that the depth of the tank below the water level should never be less than 4 feet, preferably 5 feet or deeper.

Large amounts of clear water such as obtain from rain-water leaders, cistern or other overflow pipes, must be excluded from the treatment tank.

Large amounts of greasy waste such as are discharged from laundries, kitchens, hotels, restaurants, club houses, public institutions or similar places, should be passed through an interceptor of adequate capacity or should be separately disposed of. (Sec. 34.)

Note: Section 34 of the Code provides for the use of grease traps. Experience has demonstrated that private sewage dis-

posal will function more efficiently and with less attention to operation when grease traps are employed. The reason is found in the fact that grease does not liquefy readily, and if carried over into the disposal unit it tends to clog the soil into which the effluent is discharged. Provision for adequate grease traps is therefore strongly recommended.

The length of the tank should be in the direction of the flow and should be at least twice the width to give uniform flow through the tank and to insure that the outlet is reasonably distant from the agitation caused by the inflowing sewage at the inlet.

The inlet to the tank must be inverted by means of a sanitary tee fitting with the top left open. The invert should extend from 8 inches to 15 inches below the water line. In lieu of the tee fitting a baffle board extending 6 inches above the water line and 8 to 15 inches below the water line may be used.

The effluent should leave the tank at a similar depth below the surface. This is accomplished by the placing of a sanitary tee fitting and the bottom of the outlet pipe from 2 to 4 inches lower than the bottom of the inlet pipe. The bottom of the tee or invert should extend at least 15 inches below the water line, or a baffle wall as prescribed for the inlet may be used in lieu of the tee.

The gases formed by the bacterial action in the tank escape through the inlet opening in the tee along the inlet pipe and through the soil pipe to the roof of the building. To accomplish this it is essential that fresh air inlets and openings be placed as shown in the sketches.

The septic tank must be provided with one or more manholes which must be equipped with a substantial air-tight cover (either a concrete slab or cast iron), and the opening must be large enough to permit access to the tank for inspection and cleaning.

Deep tanks, or tanks in which the water level is more than 5 feet from the surface of the ground, should be provided with wrought iron steps, placed in the manhole so as to form a ladder. (See Fig. C.)

Note: There are numerous designs of tanks and systems which if properly constructed and operated are, under normal conditions, efficient. A typical small "Imhoff" tank is shown. (Fig. C 15.)

INSTRUCTIONS FOR OPERATION AND CARE OF SEPTIC TANK

Removal of Sludge. It is essential that the sludge found at the bottom of the tank be removed whenever it rises to a point exceeding one-quarter of the liquid contents of the tank. The sludge can best be removed by an adequate pump of ship or cistern type. The fats or scum (found at the top of the liquids) may be broken up and allowed to settle or partly removed when it exceeds 8 inches in depth. The scum, by excluding light and air from the liquid, provides the conditions under which the bacteria multiply on its under surface and in the solids which settle to the bottom of the tank. Should the fats or top scum or sludge pass over into the outlet pipe it may become a factor in creating objectionable conditions at the outlet drain terminal or in rendering useless the dry well, tile absorption field, filter trench, gravel filter or other purification or disposal unit.

The sludge, fats, or scum when removed from the tank has a very offensive odor and is objectionable material, and must therefore be disposed of so that a nuisance is not created. It should be hauled away and buried or spread upon farm land and plowed under, or removed a safe distance from all dwellings in the vicinity. Such removal should take place either in the spring or fall of the year.

Safety Precautions. In the cleaning of a sewage treatment tank or dry well, extreme care must be exercised not to enter without first causing complete ventilation and removal of gases from the tank. Fatal accidents have resulted from entering tanks without first dissipating the dangerous gases. The person entering should be secured firmly by a rope held by others at the top to render assistance upon the first sign of distress below. A lantern may be used to determine the presence of foul air or gases. The extinguishment of the

flame may be accepted as a danger signal and as a warning not to enter. This method should, however, not be employed where gases from gasoline and volatile oils are apt to exist, as a dangerous explosion may result.

Starting of Siphon. Before starting the system the automatic siphon, when one is employed, must be filled with water. The manhole cover on the siphon chamber should be lifted occasionally and the action of the siphon examined (Also see "Action of Siphon," page 172.)

If the flush is not acting properly the bell of the syphon should be removed, the siphon filled with water and the bell replaced. (See Figs. C 10, C 11, C 12, and C 13.)

Protection Against Frost. It is recommended that not later than November 1 of each year all pipe lines, field tiles, manholes and tanks which may be subject to frost should be covered with a layer of damp pressed straw 12 inches thick. This layer should extend 4 feet on each side of tanks and pipes. Manure should not be used for this purpose. It will not protect the ground sufficiently against frost and may produce insanitary conditions.

Inspection of the System. To obtain the best results from a treatment plant, it is important that the entire system and especially the treatment tank and disposal units receive frequent and careful inspection, especially with reference to cleaning at regular intervals.

DISPOSAL OF TREATED SEWAGE EFFLUENT

Four methods for the disposal of treated sewage effluent (see page 155) have been referred to and are briefly described as follows:

1. **Discharge of the Effluent into Subsoil.** It may be said that this is the most common form of disposal of septic tank effluent in our state where favorable topography and subsoil conditions prevail.

This method is applicable, however, only to a limited quantity of liquid such as that represented by the flow from a residence of average size, a small school, public building or place of industry.

Its success depends almost entirely on the absorption qualities of the subsoil. Soil such as gravel, sand free from clay, or other porous ground free from water, is the best for subsoil disposal. Where compact clay prevails, disposal units of special design, such as filtration trenches, may be employed for the disposal of large or small amounts of effluent, providing a satisfactory outlet is available.

Certain restrictions which must be carefully observed are placed on the disposal of effluent by underground absorption for the protection of water supply where this is obtained from shallow wells, driven points or springs. (See sections 56, 57 and 58 of the State Plumbing Code.)

2. **Discharge of the Effluent into Streams, Etc.** Owing to the large number of rivers, water courses (dry runs), and ravines in our state, treated sewage effluent may often be disposed of satisfactorily by discharging into any of these providing no objectionable pollution or otherwise unsatisfactory conditions are created detrimental to man, stock, fish life, etc. (See the provisions of sections 57 and 58 of the Plumbing Code.) Any person contemplating sewage disposal

by any of these methods should submit the plans of the system to the State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering, for approval, or communicate with this Bureau for information. (See information sketch No. 56, page 138.)

3. Discharge into Pond or Lake. This method may be employed only where the effluent has been rendered sufficiently stable as not to create objectionable pollution.

No effluent from a sewage treatment tank is permitted to drain into a pond or lake without adequate purification. Permission must first be secured from the State Board of Health. (See sections 1407m—1 to 1407m—4 of the Statutes.)

4. Discharge Upon the Surface of the Ground. A limited amount of satisfactorily tested effluent may under the following conditions be discharged upon the surface of the ground:

(a) Upon swamp land situated a safe distance from places of human habitation, providing the area of the surface receiving such effluent is fenced to exclude cattle.

(b) Upon the ground surface, providing the disposal area is located so as not to create a nuisance or objectionable conditions, and is fenced.

Note: It should be observed that plans must be submitted for approval to the State Board of Health, Bureau of Sanitary Engineering, for all systems coming under items 3 and 4 above noted. For systems coming under items 1 and 2, permission to install must be obtained from local plumbing inspectors in cities or villages where such office is maintained; otherwise, from the local health officer or the State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering. This provision is intended also to cover rural districts and is required so that the state and local departments may know where sewage disposal plants will be located with reference to the availability of public sewers or the possibility of pollution of a public or private water supply.

SEWAGE EFFLUENT DISPOSAL UNITS

The following are typical methods or units that may be employed for the disposal of sewage effluent (liquid flowing from a sewage treatment tank):

When the effluent from any form of tank is discharged into drain tile or underground filtration trenches or upon open filters, etc. (see sketches accompanying sections 57 and 58 of the Code, also Figs. C 3 to C 13), it should pass first into a chamber provided with an adequate siphon which will discharge the contents of the chamber periodically into tile or upon the filters. Because these siphons are liable to operate continuously, due to lack of air or excessive discharge from the septic tank (which is especially true of siphons smaller than 4-inch), it is recommended that at least a 4-inch siphon be used unless a larger one is required. If a siphon is used, it should be given regular attention. Its use is not advisable in connection with a dry well except when this serves as a sprinkling filter.

Note: A more recent dosing device is not dependent upon siphonic action.

Dry Well or Leaching Basin. The dry well should consist of a chamber or well walled up with material which allows water to percolate through it freely, such as dry rubble or dry brick work. (Figs. C 1, C 2, C 5, C 6, and C 7.) The bottom is left open to the soil. The dry well should not be less than five feet in diameter and should have a depth, where practicable, of six feet or more below the inlet pipe, depending on the character of the soil and ground water level. It must be equipped with a manhole, cover and fresh air inlet. The capacity of this compartment should be such as to provide one square foot of percolating surface (including bottom) to every 5 to 10 gallons of water per day tributary to the compartment. The lower limit is to be taken for clayey or compact soil and the upper limit for sand and gravel.

Note: The use of a dry well or leaching basin for disposing of the effluent is not recommended except where there is no

danger of polluting a private or public water supply or where the use of drain tile or filter beds is impracticable. A leaching basin or dry well usually does not provide as good facilities for purifying the effluent as filter beds or drain tile laid near the surface of the soil.

Dry Wells—Where Located. A leaching basin or dry well compartment should not be located where there is any danger of contaminating a water supply, well, spring, lake or stream, or of causing a nuisance. Where possible, the leaching compartment should be located at least 50 feet from any dwelling or cistern and at least 150 feet from any surface well or spring. It may be permitted within 50 feet of a drilled well where the casing extends 100 feet below the surface of the ground and is driven firmly into soil or rock. No abandoned water supply well should be used as a cesspool or leaching compartment for a sewage disposal.

Note: The limits of distances given in the above paragraph should be taken as the lowest limit of safe distances between the dry well and the source of water supply. The danger of contamination depends almost entirely upon the character of the soil into which the sewage is discharged and upon the length of time the leaching compartment has been in use. A clayey soil full of seams, a porous rock or one full of crevices, or a very coarse gravel will allow the effluent from the leaching basin or dry well to flow directly to the well with little or no purification. A sandy or gravelly soil is the safest in which to locate leaching basins, dry wells or drain tile. Where the owner's premises are too small to attain the distances given between the well and the leaching compartment, the well should be located as near one end of the premises as possible and the leaching compartment of the disposal plant as near the other end as possible, unless by so doing his neighbor's well would be contaminated.

Drainage Tile and Siphon. Drainage tile should be used in place of a dry well where the surface soil for a depth of 3 to 6 feet is sandy or gravelly. The drainage tile should be laid from 1 to 2 feet below the surface of the ground and in a very slight grade away from the tank (about 2 inches in 100 feet). The tile should be laid in straight or curved parallel lines 10 feet or more apart. The joints should be left $\frac{1}{4}$ inch to $\frac{1}{2}$ inch apart and the tops blinded with burlap, tar paper pads, zinc or broken tile. The amount of tile laid should be based on 20 to 100 feet per person tributary to the tank, according to the character of the soil. The effluent from the tank should be discharged into the tile by an adequate automatic siphon or dosing device located in a chamber adjacent to the tank.

The capacity of the siphon chamber below the water line must be equal to the cubic contents of the tile required for the particular installation and must have a water head sufficient to insure proper siphonic action and to accommodate the dosing appliance.

The following table gives the contents capacity in gallons of drainage tile per lineal foot:

Diameter of tile in inches	Volume in gallons
3 in.	.367
4 in.	.652
5 in.	1.02
6 in.	1.46
7 in.	2.012
8 in.	2.599
10 in.	4.0195
12 in.	5.875

The amount of tile required is governed by the lay of the land and the character of the soil. This is important and must receive careful attention. The drainage tile should be laid approximately 1 foot below the surface of the ground, and where it is necessary to lay the tile deeper than 2 feet an adequate system of ventilation should be provided.

UNDERGROUND FILTRATION TRENCHES

Underground filtration trenches may be installed where the surface of the ground is such as to provide for a permissible outlet drain. (Figs. C 5, C 6, C 7, C 8, C 9, C 11.) In providing such a unit for the disposal of the effluent, the designer or installer must take into consideration the depth at which the drain leaves the basement with relation to the outlet available, together with the fall in the developed length of the drain and the head required for a siphon if one is installed. In such cases the distribution tile or drain is underlaid by a collecting drain, and the trench between the two drains is filled with filtering material, such as crushed stone or gravel, graded as shown in the cross section of the filter trench. However, if the soil is favorable or the amount of effluent is limited the effluent may during certain periods of the year, especially in dry months, be absorbed partly or wholly by the soil. The effluent after filtering through the filter material is collected by the underdrain and discharged in a purified state into a permissible outlet as previously described. Purification of the effluent is accomplished by the action of bacteria in the gravel filter material. Where the field tile is laid at a depth greater than 18 to 24 inches, the benefits of soil bacteria are small.

UNDERGROUND FILTRATION BY MEANS OF FIELD TILE FOR DISTRIBUTION AND COLLECTION DRAINS

In those areas where soil is of loose formation, such as gravel, sand or sandy loam, and where permissible outlets exist, tiled absorption fields may be successfully employed and it may be said present the safest method for disposal of sewage effluent. Such systems, however, may be encumbered so that the field tile and underdrain (where used) require frequent replacing, depending upon soil conditions and character and amount of effluent. The system consists of field tile for the distribution of the effluent, and where the field is underdrained, provides means for the collecting and conveying of the effluent to the outlet pipe. (Fig. C 10.) In such cases the soil is used as a filter instead of an absorption bed, and after filtering through a few feet of gravel, sand or loose earth, the effluent is collected by the underdrains and conveyed to an outlet. The action of the bacteria which are present in the sub-surface layers of the soil oxidizes the effluent before it finds its way into the collecting drains and is therefore in a relatively stable state, inoffensive and sufficiently harmless to permit its discharge into a water course (dry run) or upon the ground surface, at a safe distance from human habitation.

This method may, therefore, be successfully employed where a permissible outlet is available and should be used only in connection with residences and other small disposal plants. The amount of treated effluent that may be disposed of in this manner depends upon the character of the sewage, the soil formation, size of the filtration bed and operation of the plant.

The effluent from a treatment tank for disposal by an underground tile absorption filter should flow from the treat-

ment tank into a dosing or siphon chamber which may be a part of the tank or situated at any suitable distance therefrom. The overflowing effluent gradually fills the dosing chamber to a certain established level. The contents of this chamber are discharged at intervals by means of an automatic siphon into a series of open jointed field tiles laid under the ground at a depth of 12 to 30 inches. The liquid is thus gradually absorbed by the soil or soaks into underlying strata. Sketch 62 illustrates a typical system of this type.

It is obvious that if the ground is not porous, that is, if there are no indications of sand, gravel or loose loam, or if it is already waterlogged, this means of disposal cannot be adopted with success for any large amount of effluent.

Many believe that a clay subsoil may be made to absorb the septic tank effluent by placing tile pipes in a bed of broken stone or other coarse material. Assumptions like this are misleading. If ground is porous, its ability to absorb effluent will be increased by surrounding the tile pipes with broken stone or gravel. But, for an illustration, if a 6-inch diameter hole drilled in a bed of impervious clay were filled with water and it was found that the water did not soak away, it would be of no advantage to enlarge the hole to 18 inches in diameter and to line it with stone to make the water soak into the ground. The effect would merely be to increase the capacity of the hole for holding water. In this way the owner or contractor may easily determine the leaching qualities of the soil prior to installing the disposal unit. Similarly the construction of an absorption bed in a clay subsoil is equivalent to providing a reservoir to hold the sewage. It will only be a matter of time until the trenches become water-logged and the sewage backs up into the septic tank.

By the same method of deduction it may be understood that a dry well, regardless of its dimensions or capacity, located in impervious soil will serve only for such a period as it will take the inflowing effluent to fill the excavation or dry well. The actual period of service, therefore, depends upon the amount of effluent discharged daily less the actual amount of absorption by the soil. The same may be said of an underground gravel filtration trench having no outlet drain.

CONSTRUCTION OF ABSORPTION FIELD

In cases where the treatment tank is located close to the building and the effluent is to be discharged into the subsoil as it leaves the tank, the ground surrounding the house would be fouled.

A vitrified clay or cast iron pipe with water-tight joints should therefore be laid with a fall $\frac{1}{8}$ to $\frac{1}{4}$ inch per foot or more from the siphon chamber to a point at least 35 feet from the house, at which point a distribution chamber or man-hole should be constructed. The outlets must be so placed as to make for equal flow into each separate lead.

From this manhole the effluent is run through open-jointed tiles and absorbed by the ground.

As a general rule 50 feet of field tile should be provided for each person in the house, or 300 feet for a household of six.

In subsoils of sand or gravel the amount of tile per person may be reduced to 40 or even 30 lineal feet.

The lines of tile should be laid 4 feet apart with a fall of about 3 inches in 100 feet.

Open tile drains should be laid on a graded bottom and surrounded by a 9-inch bed of broken stone, brick bats, gravel or other coarse material to facilitate the absorption process and to prevent the entrance of sand or earth at the open joints of the pipes. The filter material should be covered with substantial tar paper or other adequate material to prevent the earth filling from sifting down into the filter.

In backfilling the excavation, care must be taken that the pipes and their surrounding bed be not disturbed.

Trees or bushes should not be grown over absorption beds as the roots may penetrate the openings between the tiles and obstruct the flow of sewage.

SIPHON OR DOSING CHAMBER

If the ground is suitable for an absorption field or a series of absorption trenches or an underground or above ground sand, gravel or crushed stone filter bed, a siphon chamber should be built to discharge intermittently the effluent to be disposed of by either of the above mentioned units. (See figures.)

The siphon chamber should usually be constructed as an integral part of the treatment tank so as to form a second chamber.

If an absorption field is used the capacity of the siphon chamber should be such as to cause the contents to be discharged about three times in each 24 hours. Take for example a system with daily flow of 180 gallons; this would mean a contents discharging capacity of 60 gallons or 10 cu. ft., or a chamber 3 feet long, 3 feet wide and 17 inches deep. A siphon chamber of these dimensions will be suitable for a system constructed for 12 persons or less.

Where drain tile is used, its combined area must be equivalent to the siphon chamber's liquid contents discharging capacity (see table on page 167).

Action of the Siphon. The action of the automatic siphon in discharging the treated sewage effluent is as follows:

The U trap is filled with water and as the effluent flows into the siphon chamber the air is entrapped in the bell which covers the long leg of the U. The effluent is prevented from discharging by the weight of the liquid in the short leg of the siphon. When the effluent has risen high enough in the siphon chamber the resulting head on the bell end of the siphon overcomes the pressure of the column in the short leg and part of the effluent in the latter is forced out.

This starts the flow through the siphon which continues until the effluent in the siphon chamber fails to fall to the

under side of the bell when air is again admitted. The pressures are thus equalized and the flow ceases.

An overflow pipe from the siphon chamber is necessary in case the siphon should fail at any time. This overflow also acts as a vent pipe to provide air for the siphon. If this wall is carried up to the roof of the tank, vent pipes should also be left in the wall which divides the septic tank from the siphon chamber. A manhole similar to those specified for the septic tank is required in the top of the siphon chamber, and in chambers built at some depth below the surface of the ground wrought iron steps may be provided to facilitate inspection.

Frost Protection. Investigation and experience of those using such systems indicate that septic tanks and absorption fields may be operated at shallow depths if certain requirements are rigidly observed. The requirements are as follows:

1. The absorption field whether shallow or deep must be constructed in ground which will absorb water. The more absorbent the soil the less danger there is of the field freezing.

2. The surface of the liquid in the septic tank must be a reasonable distance below the original ground level. The termination of the house drain above the ground line to provide for a head for operating a siphon and absorption field invariably results in the freezing of the liquid in the tank, dosing chamber and field tile.

3. All septic tanks, dosing chambers and disposal units and pipe lines subject to extreme frost conditions should be covered with a layer of straw at least 12 inches in thickness during the winter months.

4. The tank and absorption field must be kept in continuous use throughout the winter. If the house is left vacant for a few days or if insufficient volume of warm water is used, the system will freeze and be rendered useless until the frost goes out of the ground.

BASEMENT DRAINAGE

There are no specific statutory provisions or rules or regulations requiring the draining of basements. This is optional with the property holder. It is believed, however, that any additional expense incurred in draining the basement is justified by the sanitary advantage obtained, and it is therefore desirable that whenever possible the system be so installed as to provide for basement drainage.

NOTES ON MATERIALS AND INSTALLATION OF SYSTEM

Septic tanks and pipe lines require careful construction.

The plumbing contractor, if he does not specialize in this work himself, should undertake to see that it is properly done.

Piping. Cast iron pipes should be used in place of vitrified clay inside all buildings and under walls, where installed in close proximity to shallow wells and other sources of water supply if the sewer line is laid close to the surface, and under roadways or ground that is subject to traffic or penetration by tree growth.

Glazed vitrified clay pipes should be laid true to line and to the grades as may be required. Pipes should be jointed with cement mortar in the proportion of 1 part of cement to 2 parts of clean sharp sand.

The drain extending from the building to the disposal unit may under favorable conditions be made either of vitrified clay pipe or cast iron, installed in the same manner as generally prescribed for house drains.

Inlet and Outlet. The inlet from the building to the treatment tank should be a pipe of adequate size entering the treatment tank above the water level and be provided with inverted tee as shown. The outlet from the treatment tank to dry well or filtration trench or other disposal terminal must be at least 4-inch pipe or larger pipe with inverted tee, placed in the wall of the tank as shown, with lower side of the horizontal pipe at least 2 inches lower than the bottom or lower side of the inlet pipe. If the inverts are not used, baffle boards must be provided so as to keep floating solids from entering the dry well, filtration trench, or other disposal terminal.

Method of Ventilation. All sewage disposal systems should be ventilated in such a manner as to create a free circula-

tion of air throughout the installation by the placing of fresh air inlets, extending not less than 10 inches above the ground, at the points shown in the sketches. No such free air inlet should be placed within 20 feet of any window, door or other air intake in connection with any building used for human habitation.

Note: Free circulation of air as above referred to means air entering through one or more fresh air inlets, passing on through the units and piping in connection therewith, thence through the inverts of the treatment tank by means of the vent openings, and the air continuing onward through the house drain, soil, waste and vent pipes to a point above the building, thus not only creating an effective circulation of air but conveying all offensive odors and gases to a point above the roof.

Manhole and Cover. The treatment tanks, siphon chambers, dry wells, or similar units shall be provided with adequate manholes properly located and extended to the surface of the ground so as to make the interior readily accessible for examination and cleaning. All such manholes shall be equipped with an adequate concrete, stone or cast-iron cover.

If the covers are made on the ground from concrete, they should be provided with lifting rings and should be substantial and heavy enough to permit removal only by an adult person.

Forms. The earth bank, unless caved in, may be used for the outside form of the concrete work. The inside forms for the side walls should be 1-inch boards or 2-inch planks, whichever may be most convenient. These should be nailed to 2x4 studding spaced as may be required for rigid supporting.

Cement. A standard brand of American Portland cement should be used.

Sand. The sand to be used as part of the gravel must be free from loam or other organic matter. All soil found in pockets, or that overlying the gravel bed in the pit should be excluded.

Gravel and Sand. The gravel used for making concrete should consist of sand and small stones not over one and one-half inches in diameter. The amount of sand present should be at least 40 per cent, but not over 50 per cent. The

gravel should be clean and free from dust and other foreign matter which would impair the strength and durability of the concrete.

Concrete. The concrete for the tank should be composed of one part cement mixed with six parts of gravel, or, if crushed stone is used, it should be one part cement, three parts sand and five parts crushed rock. The concrete should be mixed on a substantial platform of planks or boards securely fastened together so that the various materials of the concrete can be kept entirely free from admixture of foreign matter. A sufficient quantity of water must be added to form a good paste. The amount mixed at one time should not exceed that amount which can be used up before the cement has time to set. The use of a concrete mixer is preferred. If mixed by hand on a board, concrete should be turned over three times dry and three times wet.

Re-enforcing. The top and wall of large septic tanks, siphon chambers and dry wells should be re-enforced with iron rods, heavy fence wire, strap iron, or any similar adequate material which may be available.

It is advisable also to re-enforce concrete walls and bottoms of all water-tight treatment tanks to prevent cracking.

Finishing of Walls. Walls and bottoms of treatment tanks should be trowelled to a perfectly smooth finish with a coating at least $\frac{1}{2}$ inch thick or one part of cement to one part of sand.

GENERAL CONCLUSIONS

The conclusions arrived at from a study of the suggested methods may be stated briefly as follows:

1. The cesspool is an obsolete and unsatisfactory method of sewage disposal. The construction of cesspools is contrary to sanitary requirements.

2. No matter what means of final disposal of the effluent are adopted, a septic tank should be built in every case for the treatment of sewage where there is no connection to a public sewer.

3. A septic tank will remove the greater part of the solids from the sewage and so lessen its offensiveness. Those solids which remain in the tank will accumulate and should be removed once or twice yearly.

4. The effluent from a septic tank is just as dangerous to health as the raw sewage discharged from the house.

5. Where the basement is not drained and the soil pipe leaves the house at a shallow depth, the septic tank should be built close to the house.

6. No septic tank effluent or liquid wastes may be discharged into a creek, river, or lake, unless a special permit has been obtained from the State Board of Health.

7. The discharge of a septic tank effluent or liquid-carried wastes into the subsoil within the limits of any city, town or village, where public sewer is available, is generally contrary to local regulations.

8. Where compact clay exists below the surface of the ground and the topsoil shows presence of sand or gravel, or is otherwise porous, a drain tile absorption field should be used for the disposal of the effluent.

9. If the soil is impervious clay throughout, an absorption field is useless, and unless a surface outlet is available no system can be made to work satisfactorily.

10. Septic tanks and pipe lines may be successfully operated during winter at shallow depths if certain requirements relating to covering (noted in these suggested methods) are observed.

11. A sewage effluent disposal unit, whether surface or underground, should be removed as far as practicable from the house and from any source of domestic water supply. The water-tight treatment tank itself may be located in close proximity to the building.

12. It is impracticable to specify the minimum distance from an underground water supply at which it is safe to discharge sewage on or into the soil.

13. Treating of sewage and disposal of treated effluent from a septic tank are two distinct and separate problems which must not be confused.

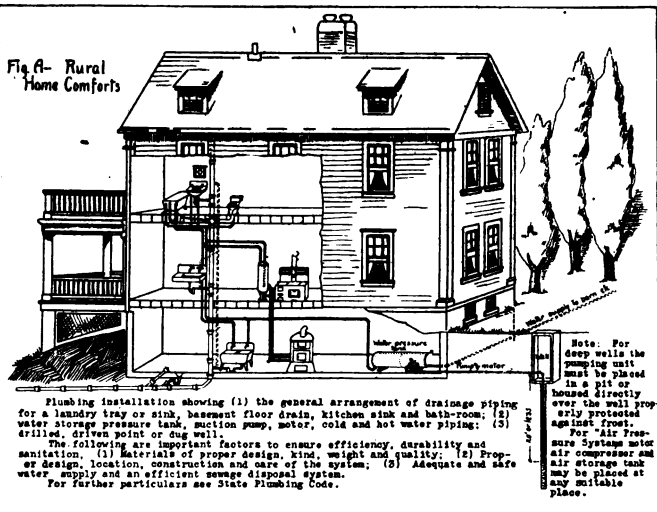
14. In some areas and local spots the disposal of effluent is a serious problem. Where compact clay prevails or the soil is not sufficiently porous and no outlet exists, it is only a waste of effort and money to construct a dry well, soil absorption field, or any similar method for disposal of sewage effluent.

15. Before selecting a building site, the question of adequate drainage possibilities, if plumbing is to be installed, should receive careful consideration.

16. Low cost in initial installation usually proves high cost in maintenance plus unsatisfactory operation and service.

17. It is safe to eat vegetables grown on soil irrigated by a septic tank effluent only if they have been cooked. Vegetables which are eaten raw, such as radish and lettuce, should not be grown on an area which may receive sewage effluent.

Fig. A- Rural
Home Comforts



Top View of Tank

Cross Section AA

Cross Section BB

The following important requirements must receive careful consideration in the designing, constructing and installing of a sewage treatment and disposal system:

- | No. of persons served | Inside dimensions of tank for a given no. of people | | |
|-----------------------|---|--------|-------|
| | Width | Length | Depth |
| 2 to 5 | 2'0" | 4'0" | 5'0" |
| 6 to 9 | 2'6" | 5'0" | 5'0" |
| 10 to 13 | 3'0" | 5'0" | 5'0" |
| 14 to 17 | 3'0" | 5'6" | 5'0" |
| 18 to 21 | 3'0" | 6'0" | 5'0" |

A system improperly designed, located or installed, or not properly cared for, is very apt to be unsatisfactory and unsafe. For further particulars communicate with the State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering, Madison, Wis.

No. of persons _____
 Capacity of tank _____
 Length _____
 Width _____ (Inside)
 Depth _____ (Inside)
 Thickness of walls _____ (From water level to Hopper line)
 Size of inlet _____
 Size of outlet _____
 Size of manhole _____

FIG. C.-SEWAGE DISPOSAL SYSTEM
CONSISTING OF A TREATMENT TANK & DRY WELL



CONDENSED DESCRIPTION OF SYSTEM ILLUSTRATED

A water-tight treatment tank so designed that the sewage is clarified by the process of detention, decomposition, liquidation, congelation, precipitation and sedimentation. Both inlet and outlet must be turned down 6 to 10 inches below water line; this can be done with a Tee fitting.

A dry well walled up with rubble, brick or other material laid loose so that it will allow water to percolate through the walls into the surrounding soil.

This method for the disposal of the effluent from the treatment tank may be used where the character of the soil is favorable, such as sand or gravel free from water, or other porous formation permitting adequate leaching, provided that the dry well is so located that there is no danger of contaminating a water supply.

The successful operation of the system depends upon its proper design, location, construction and care. The following are the important requirements:

1. Lay of the land, formation and character of the soil, and amount of fluid to be disposed of.
2. Existing conditions with relation to wells, springs or other sources of water supply.
3. Capacity of the plant, periodical inspection and cleaning of the treatment tank to prevent clogging of the dry well.

If further information is desired, write the State Board of Health, Bureau of Plumbing and Domestic Sanitary Engineering. Give full particulars relating to the premises.

Fig C. 1.

Residential sewage disposal system
consisting of treatment tank and two
dry wells - Maximum capacity 20 to 25
people

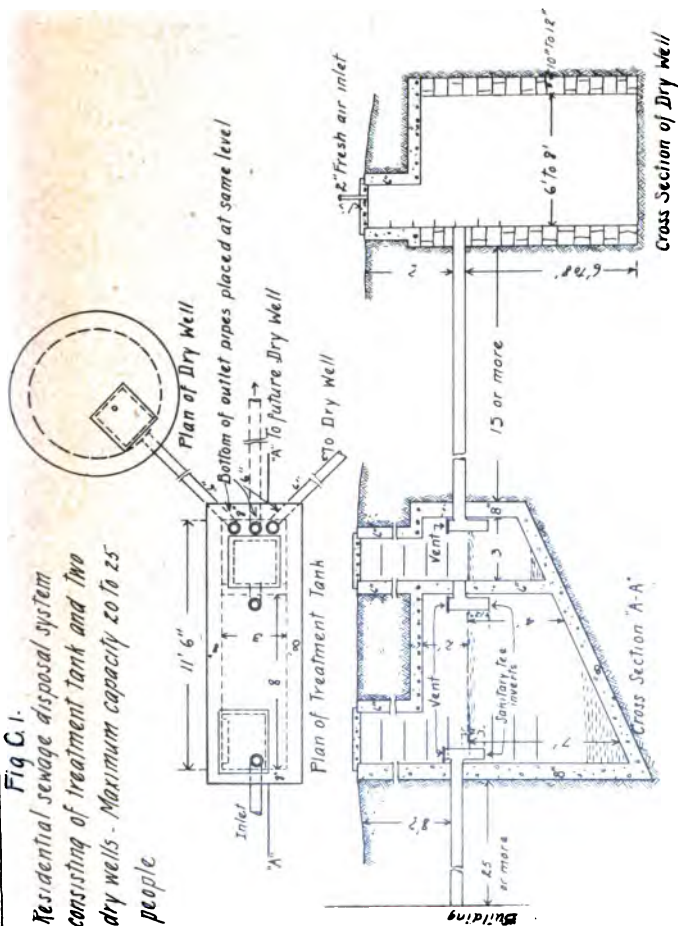


Fig. C.2- Sewage treatment and disposal unit for a school, place of employment, etc. (8 hr. day).
Maximum operating capacity 200 persons. Sewage flow based on 2 cu. ft. per person per day.

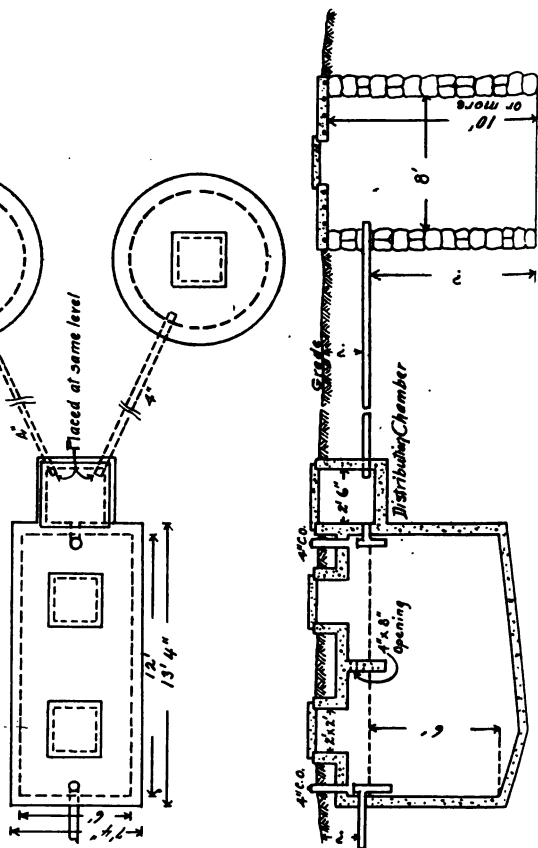
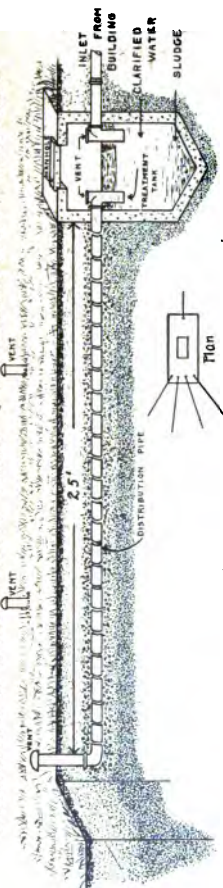


FIG. C.3- SEWAGE DISPOSAL SYSTEM FOR A SMALL HOME

CONSISTING OF A TREATMENT TANK AND AN ABSORPTION TRENCHES



This method for disposal of effluent from the settling tank may be used where the ground formation near the surface is gravel, sandy or light soil, underlain with a heavy clay or wet subsoil. The distribution pipe should be laid with a fall away from the tank of about 4 inches in 100 feet. The pipe should be either a 5 or 6 inch drain tile, laid with open joints $\frac{3}{8}$ of an inch apart, and should be surrounded by a layer of coarse gravel or crushed rock which should be 4 to 14 inches in size. This material should be covered with tar paper as indicated. The absorption trench should have a length equivalent to 5 to 10 feet for every 30 gallons of liquid to be disposed of per day. The lower limit is to be taken for light soil and the upper limit for sand or gravel.

The end of the distribution pipe is to be turned up and provided with a 2-inch vent cap extended 12 inches above the surface so as to provide for free circulation of air.

The successful operation of the system depends upon its proper design, location and construction. The following are the more important requirements:

1. Lay of the land and character of the soil, and amount of fluid to be disposed of.
2. Location so as not to pollute wells, springs or other water supply.
3. Periodical inspection and cleaning of treatment tank to prevent clogging of the trench.

If any further information is desired, consult the provisions of the State Plumbing Code, Sections 57 and 58, or write the State Board of Health, (Plumbing Division), giving full particulars.

Fig. C.2- Sewage treatment and disposal unit for a school, place of employment, etc. (8 hr. day).
Maximum operating capacity 200 persons. Sewage flow based on 2 cu. ft. per person per day.

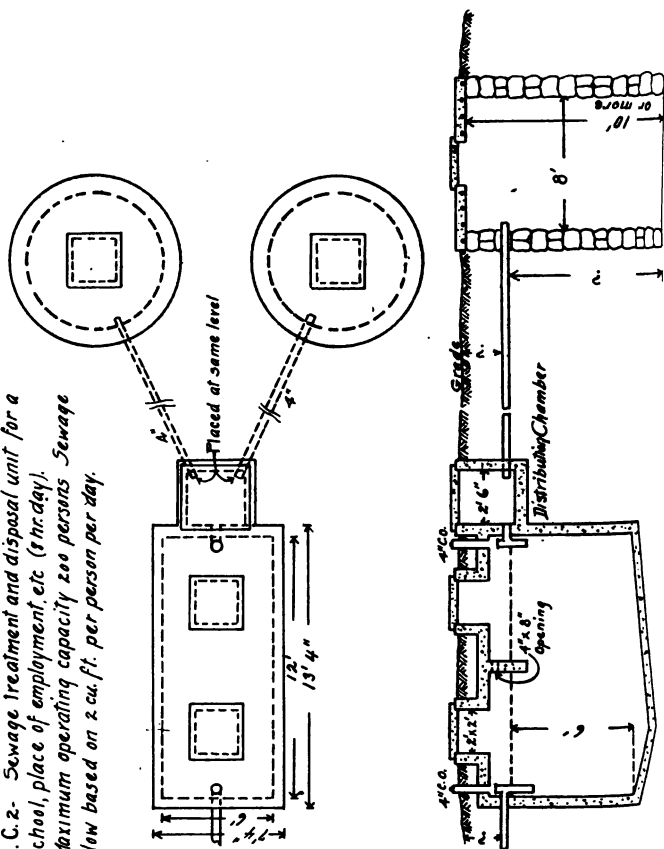
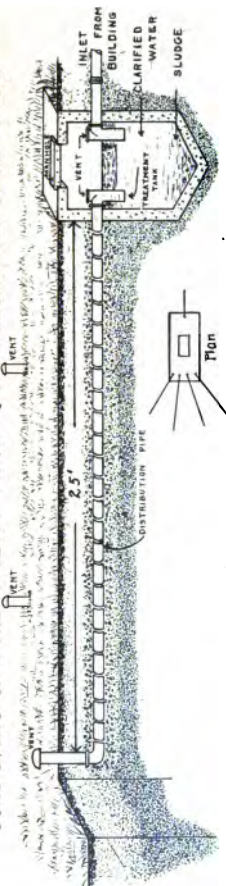


FIG. C. 3- SEWAGE DISPOSAL SYSTEM FOR A SMALL HOME

CONSISTING OF A TREATMENT TANK AND AN ABSORPTION TRENCHES



This method for disposal of effluent from the settling tank may be used where the ground formation near the surface is gravel, sandy or light soil, underlaid with a heavy clay or wet subsoil. The distribution pipe should be laid with a fall away from the tank of about 4 inches in 100 feet. The pipe should be either a 5 or 6 inch drain tile, laid with open joints $\frac{3}{8}$ of an inch apart, and should be surrounded by a layer of coarse gravel or crushed rock which should be $\frac{1}{2}$ to 1 1/2 inches in size. This material should be covered with tar paper as indicated. The absorption trench should have a length equivalent to 5 to 10 feet for every 30 gallons of liquid to be disposed of per day. The lower limit is to be taken for light soil and the upper limit for sand or gravel.

Minimum width 2'
Tar Paper
Gravel or
Crushed Rock
 $\frac{1}{2}$ to $1\frac{1}{2}$
Cross Section of
Absorption Trench

The end of the distribution pipe is to be turned up and provided with a 2-inch vent cap extended 12 inches above the surface so as to provide for free circulation of air.

The successful operation of the system depends upon its proper design, location and construction. The following are the more important requirements:

1. Lay of the land and character of the soil, and amount of fluid to be disposed of.
2. Location so as not to pollute wells, springs or other water supply.
3. Periodical inspection and cleaning of treatment tank to prevent clogging of the trench.

If any further information is desired, consult the provisions of the State Plumbing Code, Sections 57 and 58, or write the State Board of Health, (Plumbing Division), giving full particulars.

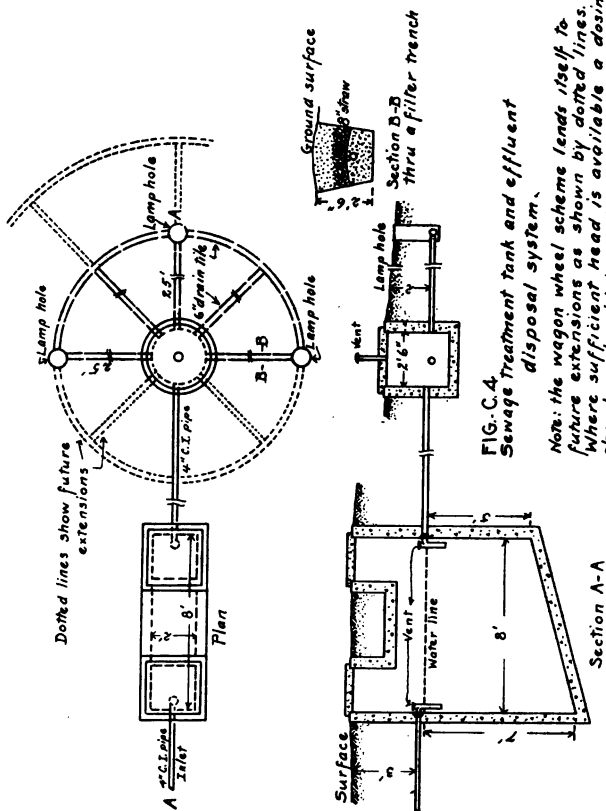
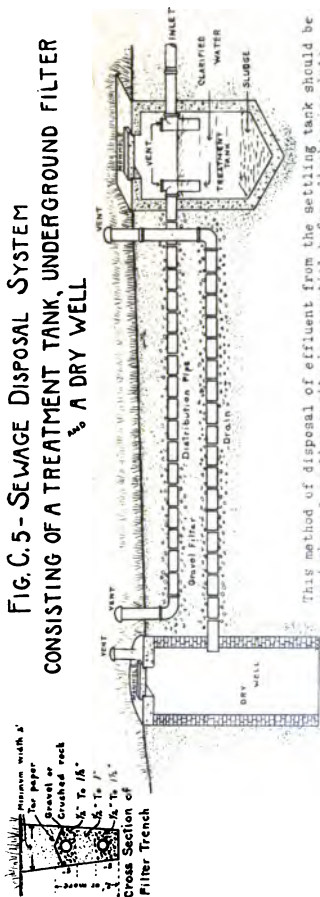


FIG. C.4.
Sewage Treatment tank and effluent disposal system.

Note: the wagon wheel scheme lends itself to future extensions as shown by dotted lines. Where sufficient head is available a dosing chamber should be installed with this type of system.

FIG. C. 5- SEWAGE DISPOSAL SYSTEM
CONSISTING OF A TREATMENT TANK, UNDERGROUND FILTER
AND A DRY WELL



This method of disposal of effluent from the settling tank should be used where a greater purity is essential before discharging into the dry well shown. The distribution and drain pipe should be laid with a fall away from the tank of about four inches in 100 feet. The pipe should be either a 5" or 6" drain tile, laid with open joints $\frac{5}{8}$ of an inch apart, and should be surrounded by a layer of coarse gravel or crushed rock, which should be carefully selected material laid as indicated in the cross section detail. This material should be covered with substantial tar paper as indicated or with adequate material to prevent the earth filling from sifting down into the gravel. The underground filter should have a length equivalent to 5 to 10 feet for every 50 gallons of liquid to be disposed of per day. The lower and upper limits given are governed by existing conditions, such as soil formation (ability to absorb) and the degree of purification necessary. The ends of the distribution and drain pipe shown are to be turned up and provided with a 2 inch vent cap extended 12" above the surface so as to provide for free circulation of air which is essential.

The successful operation of the system depends upon its proper design, location, construction and care. The following are the important requirements:

1. Lay of the land, formation and character of the soil, and amount of fluid to be disposed of by soil absorption and by means of the dry well shown.
2. Existing conditions and location so as not to pollute wells, springs and other water supply.
3. Periodical inspection and cleaning of treatment tank to prevent clogging of the gravel filter, and in course of time the renewal or cleaning of the filter.

If any further information is desired, consult the provisions of the State Plumbing Code, Sections 57 and 58, or write the State Board of Health, Plumbing Division, giving full particulars.

FIG. C.6-
m
width 2.
or
rock



This method for disposal of effluent from the treatment tank should be used where conditions permit the disposing of part of the effluent by means of a dry well and filter trench and a greater purity is essential before discharging the overflow or surplus into a lake, stream, drainage ditch, ravine, etc. The distribution and drain pipe should be either a 5" or 6" drain tile, laid with open joints $\frac{3}{8}$ of an inch apart, and should be surrounded by a layer of coarse gravel or crushed rock, which should be carefully selected material laid as indicated in the cross section detail. This material should be covered with substantial tarp paper as indicated on the plan view. The underground material to prevent the earth filling from sifting down into the gravel. The underground filler should have a length equivalent to 5 to 10 feet for every 50 gallons of liquid to be disposed of per day. The lower and upper limits given are governed by existing conditions, such as soil formation (ability to absorb) and the degree of purification necessary.

The end of the distribution pipe should be provided with a 2" vent cap extended 12" above the surface. The inlet end of the filter drain pipe is to be equipped with an overflow pipe as shown, so placed and constructed as to permit its removal for the purpose of by-passing the effluent into the lower pipe in case of stoppage, or to guard against frost, and to provide for a free circulation of air.

The successful operation of the system depends upon its proper design, location, construction and maintenance. The following are the important requirements:

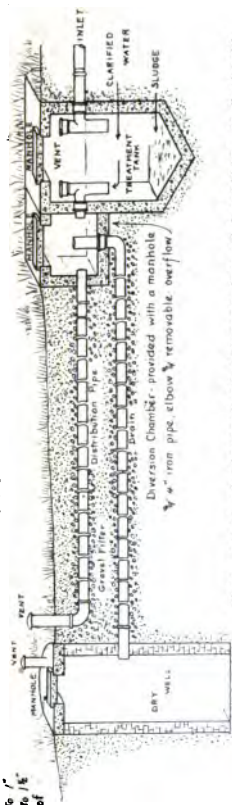
Minimum width 2'

Tar paper

Gravel or Crushed rock $\frac{1}{2}"$ To $1\frac{1}{2}"$

Filter Trench $\frac{1}{2}"$ To $1"$

Cross Section of



with a fall away from the tank of about four inches in 100 feet. The pipe should be either a 6" drain tile, laid with open joints 2/3 of an inch apart, and should be surrounded by a layer of coarse gravel, or crushed rock, which should be carefully selected material laid as indicated in the cross section detail. This material should be covered with substantial tarp paper as indicated or the earth filling from sifting down into the gravel. The underground filter should have a length equivalent to 5 to 10 feet for every 50 gallons of liquid to be disposed of per day. The lower and upper limits given are governed by existing conditions, such as soil formation (ability to absorb) and the degree of purification necessary.

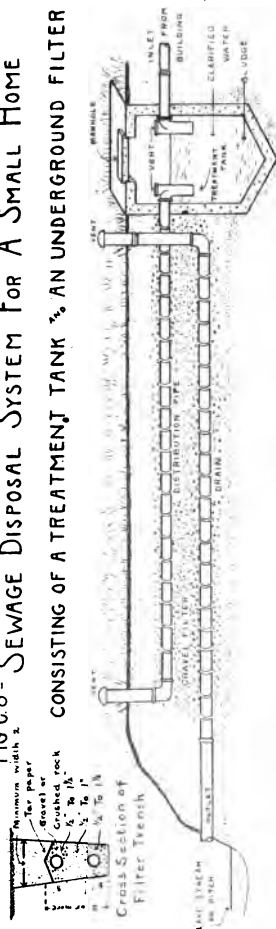
The ends of the distribution and drain pipe shown are to be turned up and provided with a 2 inch vent cap extended 12" above the surface so as to provide for free circulation of air which is essential.

The successful operation of the system depends upon its proper design, location, construction and care. The following are the important requirements:

1. Lay of the land, formation and character of the soil, and amount of fluid to be disposed of by soil absorption and by means of the dry well shown.
2. Existing conditions and location so as not to pollute well springs and other water supply.
3. Periodical inspection and cleaning of treatment tank to prevent clogging of the gravel filter and in course of time the renewal or cleaning of the filter.

If any further information is desired, consult the provisions of the State Plumbing Code, Sections 57 and 58, or write the State Board of Health, Plumbing Division, giving full particulars.

FIG. C.8- SEWAGE DISPOSAL SYSTEM FOR A SMALL HOME
CONSISTING OF A TREATMENT TANK AND AN UNDERGROUND FILTER



This method of disposal of effluent from the settling tank should be used where a greater purity is essential before discharging into a lake, stream, drainage ditch, etc. The distribution and drain pipe should be laid with a fall away from the tank of about four inches in 100 feet. The pipe should be either a 5" or 6" drain tile, laid with open joints $\frac{3}{8}$ of an inch apart, and should be surrounded by a layer of coarse gravel or crushed rock, which should be carefully selected material laid as indicated in the cross section detail. This material should be covered with substantial tar paper as indicated or with adequate material to prevent the earth filling from sifting down into the gravel. The underground filter should have a length equivalent to 5 to 10 feet for every 50 gallons of liquid to be disposed of per day. The lower and upper limits given are governed by existing conditions, such as soil formation (ability to absorb) and the degree of purification necessary.

The ends of the distribution and drain pipe shown are to be turned up and provided with a 2 inch vent cap extended 12" above the surface so as to provide for free circulation of air which is essential.

The successful operation of the system depends upon its proper design, location, construction and care. The following are the more important requirements:

1. Lay of the land, formation and character of the soil, and amount of fluid to be disposed of by soil absorption and by means of the outlet shown.
2. Existing conditions and location so as not to pollute wells, springs or other water supply.
3. Periodical inspection and cleaning of treatment tank to prevent clogging of the gravel filter, and in course of time the renewal or cleaning of the filter.

If any further information is desired, consult the provisions of the State Plumbing Code, Sections 57 and 58, or write the State Board of Health (Plumbing Division) giving full particulars.

FIG C 9 SEWAGE DISPOSAL SYSTEM FOR A SMALL HOME
CONSISTING OF A TREATMENT TANK & AN UNDERGROUND FILTER



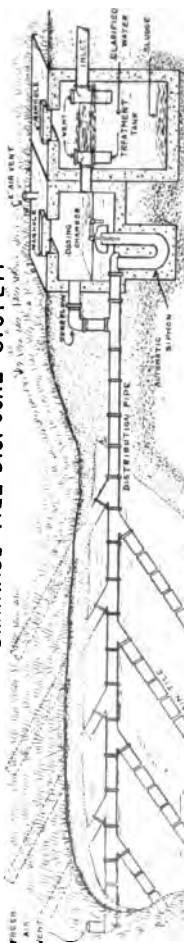
This method of disposal of effluent from the settling tank should be used where a greater purity is essential before discharging into a lake, stream, drainage ditch, etc. The distribution and drain pipe should be laid with a fall away from the tank of about four inches in 100 feet. The pipe should be either a 5" or 6" drain tile, laid with open joints $\frac{3}{8}$ of an inch apart, and should be surrounded by a layer of coarse gravel or crushed rock, which should be carefully selected material laid as indicated in the cross section detail. This material should be covered with substantial tar paper as indicated or with adequate material to prevent the earth filling from sifting down into the gravel. The underground filter should have a length equivalent to 5 to 10 feet for every 50 gallons of liquid to be disposed of per day. The lower and upper limits given are governed by existing conditions, such as soil formation (ability to absorb) and the degree of purification necessary. The ends of the distribution and drain pipe shown are to be turned up and provided with a 2 inch vent cap extended 12" above the surface so as to provide for free circulation of air which is essential.

The successful operation of the system depends upon its proper design, location, construction and care. The following are the more important requirements:

1. Lay of the land; formation and character of the soil, and amount of fluid to be disposed of by soil absorption and by means of the outlet shown.
2. Existing conditions and location so as not to pollute wells, springs or other water supply.
3. Periodical inspection and cleaning of treatment tank to prevent clogging of the gravel filter, and in course of time the renewal or cleaning of the filter.

If any further information is desired, consult the provisions of the State Plumbing Code, Sections 57 and 58, or write the State Board of Health (Plumbing Division), giving full particulars.

FIG.C.10- SEWAGE DISPOSAL SYSTEM
CONSISTING OF A TREATMENT TANK, SIPHON DOSING CHAMBER
AND DRAINAGE TILE DISPOSAL SYSTEM



CONDENSED DESCRIPTION OF THE SYSTEM

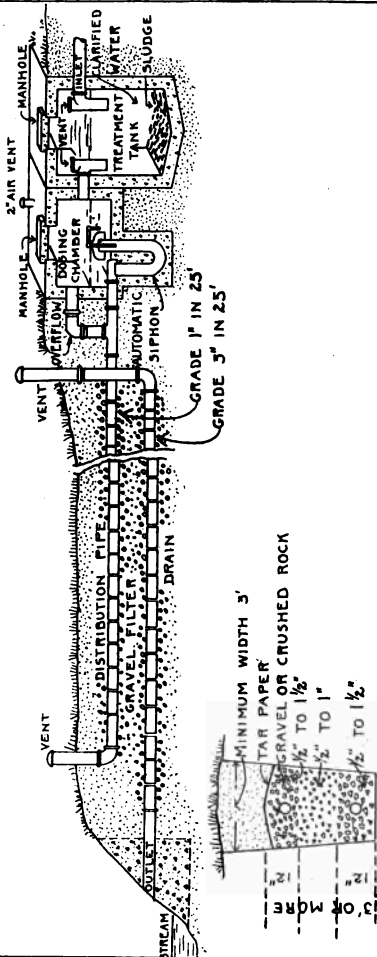
1. A water-tight treatment tank so designed that the sewage is clarified by the process of detention, decomposition, liquidation, congelation, precipitation and sedimentation. (For location, design, capacity, materials and construction, see blue-print B4 and specifications C15 - 16.)

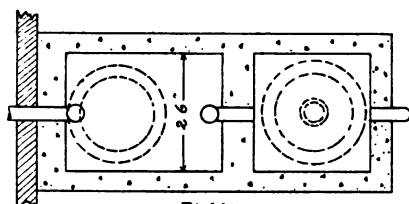
2. A water-tight dosing chamber provided with a syphon device so arranged that the clarified liquid from the treatment tank is automatically and intermittently discharged into the drain tile absorption system shown consisting of an agricultural drain tile absorption system laid with open joints, for the disposal of the liquid waste. (For details giving design, capacity and construction, see blueprints D9 and 12, specification C19, and sections 57 and 58 of the State Plumbing Code.)

This method will give satisfactory results where the top soil is sandy or loose, porous formation. Design, location and construction of the various units comprising the installation must receive careful attention. The following are the more important requirements:

1. Location of the various parts with reference to the topography of the land.
 2. Existing conditions with relation to wells, springs, streams or other source of water supply.
 3. The capacity of the dosing chamber and syphon arrangement and the drain tile necessary according to the character of the soil and volume of liquid to be disposed of.
 4. The fall or difference in elevation between the house outlet and the treatment tank, and the fall required between the water level in the dosing chamber and the drain tile field. For the latter from 3' to 3'6" are required.
 5. Periodical inspection and cleaning of the treatment tank and syphon to prevent clogging of the tile absorption field.
- If any further information is desired, write the state board of health, Plumbing Division, for full particulars.

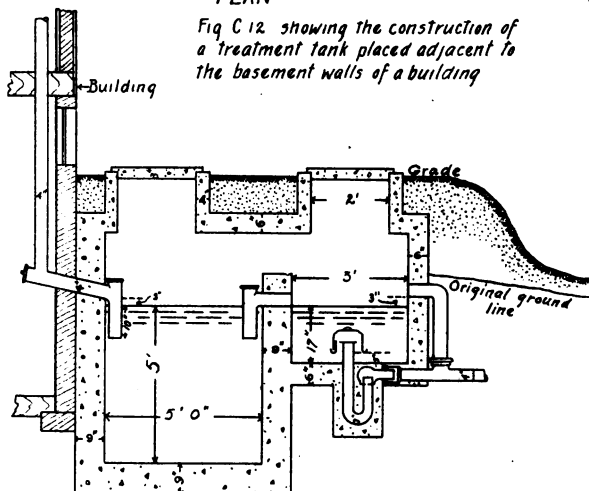
FIG C11 - SEWAGE DISPOSAL SYSTEM CONSISTING OF A
TREATMENT TANK, DOSING CHAMBER, AN UNDERGROUND FILTER





PLAN

Fig C 12 showing the construction of a treatment tank placed adjacent to the basement walls of a building



Sewage Disposal System

Plan of Tank (approx. distribution chamber)
 This plan view shows a rectangular distribution chamber with a width of 12' 0" and a length of 4' 0". It includes a 1" x 4" inlet pipe, a 6" x 6" outlet pipe, and a 6" x 6" outlet pipe. The chamber is divided into sections by a 1" x 4" pipe and a 6" x 6" pipe. The outlet is labeled "Outlet to filter".

Cross Section of Filtration Bed
 This cross-section shows a filtration bed with a width of 4' 0" and a height of 2' 0". It includes a 6" x 6" inlet pipe, a 6" x 6" outlet pipe, and a 6" x 6" outlet pipe. The bed is divided into sections by a 1" x 4" pipe and a 6" x 6" pipe. The outlet is labeled "Outlet to filter".

Cross Section of Filtration Tank
 This cross-section shows a filtration tank with a width of 4' 0" and a height of 2' 0". It includes a 6" x 6" inlet pipe, a 6" x 6" outlet pipe, and a 6" x 6" outlet pipe. The tank is divided into sections by a 1" x 4" pipe and a 6" x 6" pipe. The outlet is labeled "Outlet to filter".

Fig. 13 - Sewage treatment tank
 This diagram shows a sewage treatment tank with a width of 12' 0" and a height of 2' 0". It includes a 6" x 6" inlet pipe, a 6" x 6" outlet pipe, and a 6" x 6" outlet pipe. The tank is divided into sections by a 1" x 4" pipe and a 6" x 6" pipe. The outlet is labeled "Outlet to filter".

Fig. 14 - Sewage treatment tank
 This diagram shows a sewage treatment tank with a width of 12' 0" and a height of 2' 0". It includes a 6" x 6" inlet pipe, a 6" x 6" outlet pipe, and a 6" x 6" outlet pipe. The tank is divided into sections by a 1" x 4" pipe and a 6" x 6" pipe. The outlet is labeled "Outlet to filter".

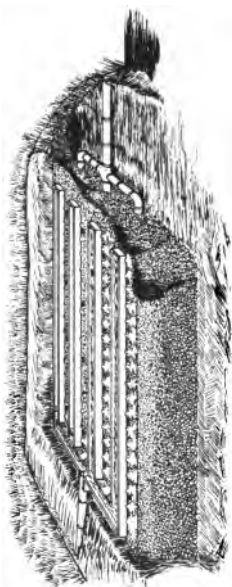


FIG. G.14 - FILTER BED FOR THE PURIFICATION OF SEWAGE EFFLUENT

This method for the treatment of the effluent from the settling tank, may be used where the soil is very compact or swampy, or a greater purity is essential before discharging into a watercourse, ditch, stream, or lake. The filter is constructed of material as shown, such as sand and gravel, crushed stone or cinders. The bed should be from 2 to 3 feet in depth and should have from 20 to 30 square feet of surface per person, depending upon the character of the filter material and sewage effluent, and the degree of purity essential. Where two beds are employed 10 to 15 square feet of surface per person should be provided.

LOCATION: It should be so located that a fall of from $1/8$ to $1/4$ inch per foot can be obtained and that a sufficient area for the filter material is available. The earth removed in the making of the excavations of the filter bed may be used for providing embankments to secure the depth required, as shown, and to keep surface water from entering the filter enclosure. The underdrainage piping serves the purpose of carrying off the purified liquid which seeps through the filter material as illustrated.

The troughs shown are constructed of wood laid with a fall of one inch in 50 feet, and are provided with $3/4$ inch outlet openings placed at intervals of 10 to 12 inches. The troughs should be 4 inches wide and 3 inches high, inside dimensions. Each trough should preferably be provided with a gate placed where it branches into the 8 inch distributing trough so that the different troughs may be used in alternate turns to dry and air out the filter material. Weekly alternates are essential in order to get the best results. That portion of the bed not in use should be thoroughly raked to a depth of 2 to 3 inches to permit purification by air and sunlight. The rest period should be at least one week.

An arrangement for by-passing the sewage in winter into the lower center pipe should be employed where there is danger of the filter freezing, or some other frost protection provided, such as straw or similar covering placed in hooded form.

For further particulars consult the State Board of Health, Plumbing Division, Madison, Wis.

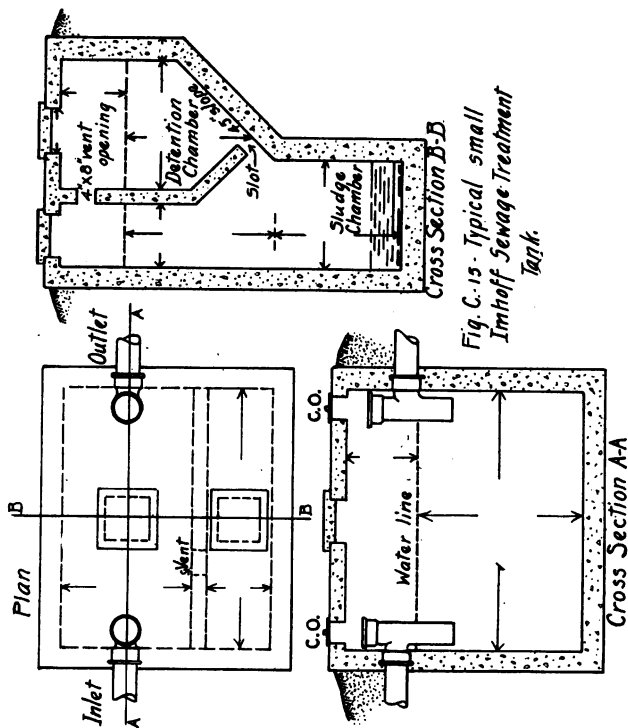


Fig. C. 15 - Typical small Imhoff Sewage Treatment Tank.

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1. State Plumbing Code.
2. Public Comfort Station Code and Rest Room Suggestions.
3. Rural School Privy Code.
4. Chemical and Dry Closet Code.
5. Plumbers' License Directory.
6. Private Water Supply and Sewage Disposal.
7. Tourist Camp Site Sanitation.
8. Summer Resort Sanitation.

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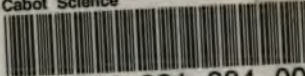
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